Vol. XIX. Part 3.

NATIONAL MUSEUM OF VICTORIA

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The Journal of the Department of Agriculture of Victoria, Australia.

March, 1921.

PRINCIPAL CONTENTS

Nhill Crop and Fallow Competitions

New Zealand Flax

Standard Test Cows

Peach Growing in Victoria

Home Wine Making

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OF

THE DEPARTMENT OF AGRICULTURE,

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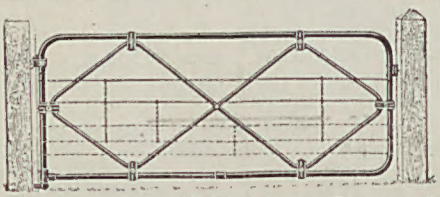

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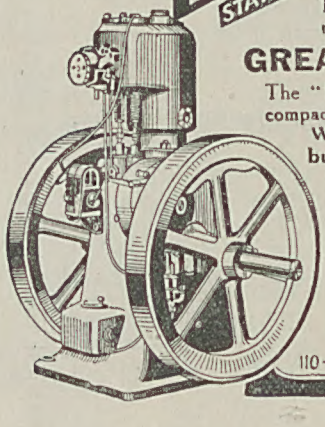

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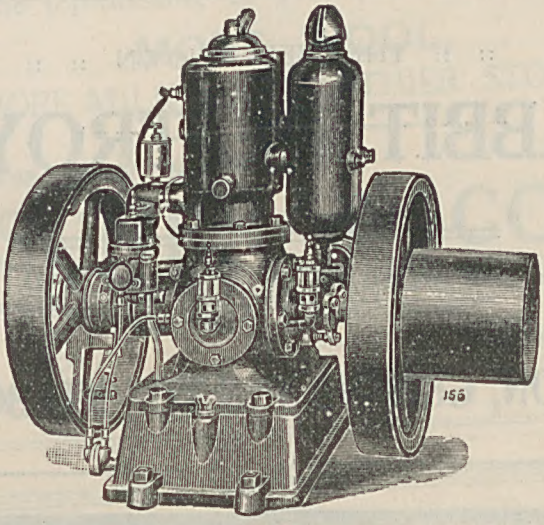

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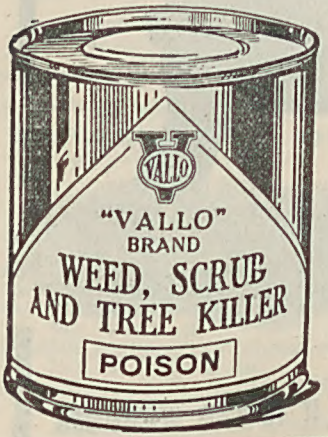

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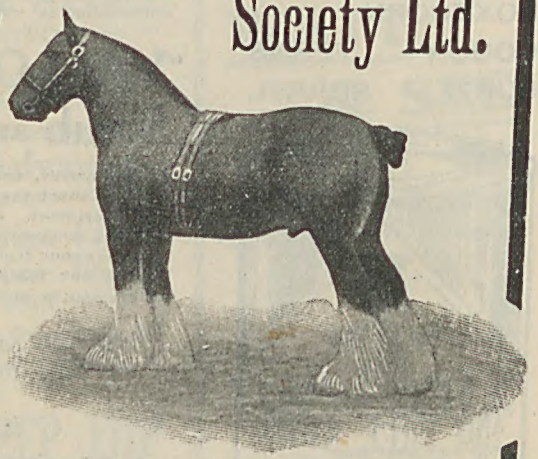

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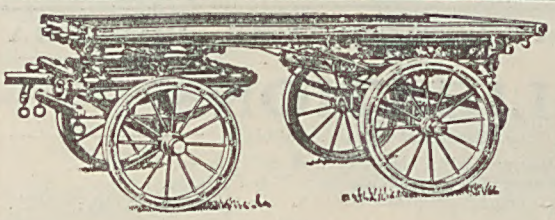

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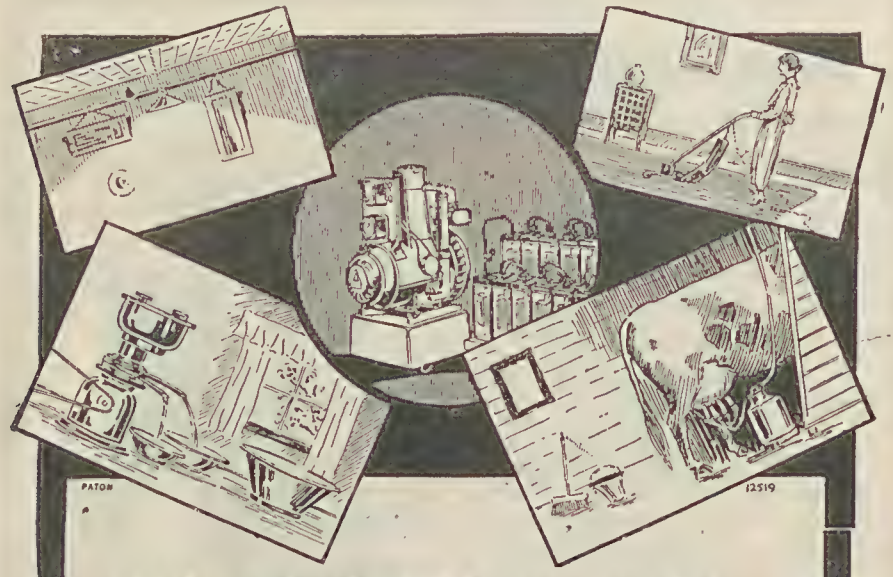

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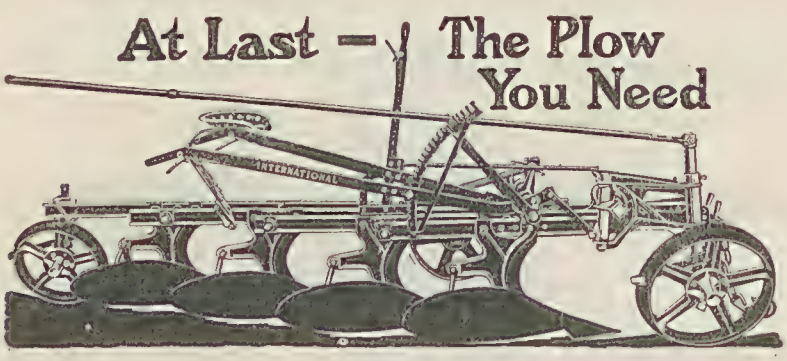

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NHILL CROP AND FALLOW COMPETITION.

Report of Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer.

I have much pleasure in forwarding herewith my report as judge of the Twentieth Annual Crop and Fallow Competition recently held by your society at Nhill.

The society's efforts were rewarded this year with the record entry of eighty-one competitors. This number—the greatest for the whole twenty-one years over which the competitions have been conducted—is a tribute to the unfailing popularity of this educational movement. The Nhill society has reason to be proud of the fact that its valuable pioneering efforts have not passed unnoticed. This year competitions on the lines of those held at Nhill were conducted in eleven distr'cts in the Wimmera and Mallee, viz.: Horsham, Dimboola, Nhill, Minyip, Warracknabeal, Kaniva, Rupanyup, Goroke, Beulah, Sea Lake, and Ouyen—an increase of ten in four years. In addition there is the Royal Agricultural Society's £100 competition for the champion farm of the Wimmera. It is safe to say that the whole of these competitions owe their origin to a recognition of the value of the work done at Nhill.

The Season.

The season was distinguished by a particularly dry autumn and a moist spring. On the whole conditions were ideal for the growing of wheat crops, though farmers found considerable difficulty in germinating and disposing of the wild oats and rubbish on the fallows before seeding time.

The crops throughout the district were particularly good, and will probably yield exceptionally well. The cool weather experienced during the ripening period should have assisted them.

As usual, many of the crops and fallows had some features of interest to keen wheat-growers.

Results.

Section I.—Best Half of Farmer's Wheat Crop.

The winning crop in this section was 130 acres of Federation wheat shown by W. E. Dahlenburg, of "Ellerslie," Salisbury. The crop was dense, and should yield exceptionally well. It was grown on black plain land which had numerous red patches, yet was surprisingly even. Mr. Dahlenburg pays special attention to these red patches, and is particular to harrow the whole paddock as soon as possible after the first ploughing. In this way the red land is broken down before it has time to set into the refractory lumps so often seen on this class of soil in the Wimmera.

The paddock was summer fallowed. It was ploughed in March to a depth of 4 to 4½ inches; subsequently it was scarified, spring-

Mr. W. E. Dahlenburg's 1st Prize Crop of Federation.

toothed cultivated twice, and harrowed three times. The crop was sown during the last week in June with 80 to 85 lbs. seed and 120 lbs. superphosphate. The new combined springtooth cultivator-drill was used.

The crop was harrowed a week after sowing to kill rubbish, and portion received a further harrowing. The most important factors which appear to have contributed to the heavy yield of this crop are the careful summer fallowing, the heavy weight of seed used per acre, and the liberal dressing of manure. In addition, the sowing was not made too early. An interesting contrast was provided on this farm between the winning crop and a portion sown in May.

The second prize is awarded to A. P. Koop, of Ni Ni Well. This crop of Federation was in every way a show crop, though the yield was apparently not so heavy as that of the winner.

It received the following treatment:—Fallowed to 3½ inches in July, harrowed and springtoothed in September, then harrowed again, then it was scarified in October. After harvest the land was harrowed after rain, and scarified in front of the drill. The crop was drilled towards the end of June with 66 lbs. Federation wheat and 80 lbs. super. This crop was particularly free from wild oats and takeall, and was very clean underfoot.

The third prize crop, that of Mr. A. H. Schuller, of Ni Ni Well, was mainly of the Perfection variety—a new wheat selected from a crop of Dart's Imperial by Mr. Schuller. This crop did not appear as if it would yield so heavily as some of the others, yet it was undoubtedly the cleanest one exhibited. It was also especially pure and free from foreign heads. It was grown on well worked winter

The Crop of Federation Awarded 2nd Prize.

(Grown by Mr. A. P. Koop, Ni Ni Well.)

fallow, and sown with 80 lbs. of seed and 112 lbs. superphosphate. The crop was harrowed twice after sowing for the purpose of killing rubbish —work that had been most effectively accomplished.

Heavy crops were also exhibited by R. Blackwood, A. Schultz, and A. W. Goodwin. Any one of them would probably have been good enough to win the competition in an ordinary year, but owing to the large number of entries it was necessary to separate the competitors by docking marks for the slightest fault. Most of these competitors lost marks for the presence of wild oats and foreign heads.

Mr. Moulden's crop of Federation, the whole of the seed for which was obtained from the Longerenong College last year, was the best type of Federation shown in the district. There was a falling away from the usual high standard of purity in the crops exhibited.

Details.—Section I.

Best half of Farmers' Wheat Crop (not less than 75 acres).

Name.	Yield.	Trueness to Type.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Total.
Points allotted	**35**	**20**	**15**	**15**	**15**	**100**
W. E. Dahlenburg ..	35	16	13	12	15	91
A. P. Koop	32	15	14	14	15	90
A. H. Schuller	25	20	14	15	15	89
A. Schultz	30	18	12	13	14	87
James Moulden	24	20	14	15	13	86
R. Blackwood	30	17	15	11	13	86
J. B. Marshall	26	17	13	13	15	84
A. W. Goodwin	30	17	12	10	13	82
J. and T. W. Rintoule ..	27	16	8	15	15	81
O. H. Lienert	25	17	12	11	14	79
E. J. Hoffman	24	18	10	12	14	78
Crouch Bros.	26	17	12	9	13	77
Chas. Reichelt	26	15	12	12	11	76
J. Meagher	22	16	7	15	9	69
J. H. Reichelt	19	14	12	10	11	66
Bond and Hegarty ..	18	17	11	7	13	66

A Heavy Crop of Federation Wheat.
(Grown by Mr. J. Meagher, Lawloit.)

Please note that the points for yield given in this table do not represent apparent yield in bushels per acre, but the differences separating them do. The yield of the winning crop was estimated at more than 35 bushels per acre.

Section Ia.—For Best Small Farm Less than 1,000 Acres, for Prize the gift of Mr. W. E. Dahlenburg.

The competitors in this section are Messrs. E. J. Hoffman, O. H. Lienert, and J. H. Reichelt.

Owing to pressure of work, portion only of these farms were judged. The balance of the judging will be carried out in March, when complete results will be made available.

Section II.—Best 100 Acres Mallee Crop.

Mr. O. H. Lienert's crop at Lorquon was an easy winner in this section, Major and Yandilla King were the varieties exhibited, sown on well-worked winter fallow, 62 lbs. of seed being used, and 89 to 90 lbs. of superphosphate. Mr. Lienert also had some splendid stubble crops. The general success of these stubble-sown crops this year, however, will not induce sound farmers to depart from their regular practice of careful fallowing. They know too well from bitter experience that in the average year stubble crops are unpayable ones.

Mr. C. P. Wohler's crop was second.

Details.—Section II.

Best 100 Acres of Wheat on Mallee Land.

Name.	Yield.	Trueness to type.	Absence of Disease.	Absence of Weeds.	Evenness.	Total.
Points allotted	**35**	**20**	**15**	**15**	**15**	**100**
O. H. Lienert	27	18	14	15	15	89
C. P. Wohlers	24	16	8	12	12	72
J. B. Marshall	18	15	8	10	12	63

The Fallows.

This year was not a very favorable one for fallowing. The early winter months were dry and the spring wet. Weeds did not germinate at all well until fairly late, but later on they made very vigorous headway. As most of the farms had depleted flocks of sheep, reliance had to be largely placed on the cultivation implements for weed killing. It was essentially a season, therefore, to test the skill of the farmer, and throughout the Wimmera were to be seen many fallows on which the weeds had got the upper hand. Notwithstanding these drawbacks the best fallows at Nhill this year were of very high merit. It may be said confidently that at no time in the past four years, during which the writer has judged at Nhill, have there been such good fallows shown by the best men, nor has there been so much difficulty in separating them for the purpose of awarding the prize.

Results.—Section III.

Best black fallowed land.

W. E. Dahlenburg was placed first with 99 points, R. Blackwood next with 98, and C. F. H. Reichelt third with 97.

There was very little difference between the first five or six men. Mr. Dahlenburg's fallow was one of the most perfect yet seen in the Wimmera. It consisted of two paddocks of summer fallow—one 120

acres and the other 60 acres. The larger paddock received the following treatment:—Ploughed February and March, scarified in June and July, cultivated with springtooth at the end of August, scarified middle of October, and harrowed at the beginning of November, and portion again in mid-November. The smaller paddock was ploughed in January, harrowed at end of March, scarified middle of July, and harrowed at end of July. Subsequently it was scarified early in October, springtoothed at end of October, and harrowed at the beginning of November.

Mr. Dahlenburg had paid special attention to working the red patches in these paddocks, and they were in good condition. By working the red land sufficiently early so as to catch it before it dries out, the black land in the same paddock receives ideal treatment also.

Judging the 2nd Prize Fallow, Mr. Blackwood's, Kiata East.

There was 2½ inches of fine mellow loose dust mulch evenly spread over this fallow, and below was a firm and moist seed bed, so damp that it could be moulded with the hand.

The cultivation implements had missed no land, and had worked at even depth; every acre was worked equally well.

Mr. Blackwood's fallow, which was awarded second place, was mainly summer fallow. The land was ploughed in February and March from 4½ to 5 inches deep. In June it was well scarified to 3 inches; in September springtoothed across; in October springtoothed across again. Finally it was harrowed after rain in November. Mr. Blackwood, than whom there is no more consistent wheat-grower in the Wimmera, prefers the summer fallow, and makes it a practice of ploughing deep and shallowly on alternate fallowings. The deep working would be given in a wet year.

Mr. Reichelt's fallow was placed third. It was winter fallow. The land had been given no less than six workings after first ploughing in July. They were mainly given with light implements, such as springtoothed cultivator or harrows. Mr. Reichelt makes a specialty of diagonally harrowing the paddock; in this way the direction of the harrowing is never the same as that of any of the heavier implements. While a certain amount of time is lost in short turns at the corners, there is no doubt as to the value of the practice in breaking down the black land and in settling it down to a well consolidated state.

Mr. R. Blackwood's Heavy Crop of Penny Wheat at Kiata East.
(75 lbs. seed, 112 lbs. super.)

Details.—Section III.

Best fallowed land, not less than 100 acres.

(All of competitor's fallow to be shown.)

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
W. E. Dahlenburg ..	25	24	25	25	99
R. Blackwood	24	24	25	25	98
C. F. H. Reichelt ..	25	23	25	24	97
A. G. Dahlenburg ..	25	24	25	22	96
C. P. Dahlenburg ..	25	23	23	23	94
James Moulden	22	23	25	24	94
O. H. Lienert	24	22	22	24	92
E. J. Hoffman	24	22	25	21	92
A. W. Goodwin	22	21	24	24	91
Crouch Bros.	22	22	22	24	90
E. H. Schuller	24	22	21	21	88
Peter Bone, junr. ..	23	21	22	21	87
C. Roediger	22	20	24	19	85
J. H. Reichelt	21	20	18	17	76

RESULTS.—SECTION IV.

For best red fallowed land.

The object of this competition was to endeavour to discover the best method of working the stiff red lands, of which there are extensive patches in the district; but so far only those competitors with red land of a rather easily worked type have entered.

C. H. Roediger was the winner, with E. Tassicker second.

DETAILS.—SECTION IV.

For best red fallowed land, not less than 100 acres.

(All competitor's land to be shown.)

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total
Possible points	**25**	**25**	**25**	**25**	**100**
C. H. Roediger	24	23	25	24	96
E. Tassicker	24	22	22	22	90

RESULTS.—SECTION V.

For aggregate points for fallow (1920) and crop on the fallow (1921).

(The fallows only were judged this year).

Mr. W. E. Dahlenburg was first, R. Blackwood second, and A. E. Dahlenburg third. The details for these fallows have already been discussed under section III. The crops on these fallows will be judged next year.

DETAILS No. V.

For best wheat crop on fallow. Fallow judged, 1920. Crop on the fallow, 1921. Points for crop and fallow to be added together.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
W. E. Dahlenburg ..	25	24	25	25	99
R. Blackwood	24	24	25	25	98
A. E. Dahlenburg ..	25	24	25	23	97
C. P. Dahlenburg ..	25	23	23	23	94
Crouch Bros.	22	22	22	24	90
Peter Bone, junr. ..	23	21	22	21	87
C. Roediger	22	20	24	19	85

RESULTS.—SECTION VI.

In this section the whole of the farmer's fallow and the crops on that fallow are judged for several years, and a prize awarded for the highest aggregate of marks. The prize was offered for competition by Mr. Alfred Schultz, of Nhill. The rules provide a severe test.

The winner was Mr. R. Blackwood, of Kiata East, who gained an aggregate of 335 marks out of a possible 400 in the three years. Messrs. Crouch Brothers, Kiata, were second with 329, and Mr. Peter Bone, Kiata East, third with 328. Several of the competitors in the earlier years withdrew, as they were unable to maintain the pace set by the leaders.

Details.—Section VI.

Aggregate points.—For the entire fallow, 1918. The crop on that fallow, 1919. The entire fallow, 1919. The entire crop, 1920.

Name.	Fallow.		Crop.		Total.
	1918.	1919.	1919.	1920.	
R. Blackwood	83	91	77	84	335
Crouch Bros.	82	89	86	72	329
Peter Bone, junr. ..	89	80	77	82	328
C. F. H. Reichelt ..	84	80	68	71	303

Results.—Section VII.

For the highest aggregate marks for fallow, 1919, and for the crop on that fallow, 1920.

The fallow was judged last year, and the crop on the fallow this year.

W. E. Dahlenburg secured the highest aggregate with 187 points; R. Blackwood was second with 183, and James Moulden third with 179.

The leading points of these crops and fallows have already been discussed.

Section VII.

For best wheat crop, 1920, on Fallow judged, 1919. Prize for aggregate points of Crop and Fallow.

Name.	Yield.	Type.	Disease.	Weeds.	Evenness.	Total.	Total for Fallow, 1919.	Grand Total.
Possible points ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
W. E. Dahlenburg	35	16	13	12	15	91	96	187
R. Blackwood ..	30	17	15	11	13	86	97	183
Jas. Moulden ..	27	19	15	11	13	85	94	179
Crouch Bros. ..	28	17	13	10	13	81	95	176
Peter Bone, junr.	32	15	14	9	13	83	90	173
A. H. Schuller ..	25	20	14	15	15	89	84	173
A. W. Goodwin	30	17	12	10	14	83	87	170
R. O. Buckley ..	23	18	11	10	10	72	81	153
E. Tassicker ..	22	15	9	10	12	68	81	149

Results.—Section VIII.

The rules for this section provide for the continuance of No. 7 competition.

Mr. W. E. Dahlenburg won the first year with 99 points; R. Blackwood was second with 98, and Crouch Brothers third with 90 points.

Details.—Section VIII.

For the highest aggregate awarded for whole of farmer's fallow, 1920. Crop on the fallow, 1921. The whole of fallow, 1921. Crop on the fallow, 1922.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
W. E. Dahlenburg ..	25	24	25	25	99
R. Blackwood	24	24	25	25	98
Crouch Bros.	22	22	22	24	90
Peter Bone, junr. ..	23	21	22	21	87
C. Roediger	22	21	24	20	87
J. H. Reichelt	21	20	18	17	76

Some Lessons from the Competitions at Nhill.

Harrowing after the Crop is up.

On most of the black land in the Wimmera, especially on the "plains," farmers no longer sow early. They prefer to wait until at least two successive crops of rubbish have germinated and been killed with the scarifier before sowing the crop. They are not at all alarmed if seeding does not begin till the end of June. Payable crops have even been sown as late as August. July sowing is now practically standard practice on the "plains." As a rule, it results in yields 4 or 5 bushels ahead of May sowings. That has also been demonstrated on the experimental plots at Longerenong College over a number of years. In very dry seasons the early sowing is better, but for an average of years, including the dry years, the late sowing comes out on top.

The late sowing, however, does not apply to the red land, the black country in the wetter districts of the Wimmera, nor to wet "crab-holey" land. Here it is essential to begin seeding in May, if possible. At Nhill, however, even on the black flats, farmers still prefer to start about mid-May. As a rule, there are sufficient light showers to germinate the rubbish before that.

It occasionally happens, however, that the germination of the weeds is unsatisfactory—as in the present season. Harrowing after the crop is up may then be done with advantage. The practice was successfully demonstrated at a number of farms at Nhill this year. There is no danger of hurting the young crop. Harrowing, in some cases repeated several times, was resorted to by growers of some of the heaviest and cleanest crops.

Mr. W. E. Dahlenburg harrowed his crop; so did Messrs. P. Koop, Alf. Schultz, and A. H. Schuller. At Nhill the harrowing is practised when the crop is quite young—a week or two after sowing. On red land it is usual to allow the crop to get a stronger root hold. The harrowing on red land has the added advantage of preventing the

surface soil from running together; that is why it is advocated for the clay lands of the Goulburn Valley and the western plains in any year.

Summer Fallowing.

The continued success in the Wimmera Farm Competitions during the past four years of the crops grown on summer fallowed land hardly leaves room for reasonable doubt that the practice is a most profitable

Mr. C. H. Lienert's Comfortable Residence, Lorquon.

Residence of Mr. J. Meagher, Lawloit.

one. The general consensus of opinion is that, other things being equal, the yields from the summer fallowed crops are from one to two bags per acre better than from winter fallowed crops. Dozens of leading Wimmera farmers have subscribed to that view when questioned on the subject, and their crops back up their opinions. These results have never yet been accurately tested on the State Experiment Farms, so definite evidence cannot be offered. Apart altogether, however,

from the question of yield, summer fallowing is an economical practice—that is if a portion of the land be so treated. It enables the farmer to do some of his fallowing in February and March, and hence reduces the strain on the slower moving implements in the winter. It also provides opportunities for cleaning the land thoroughly.

Summer fallow is practically a fifteen months' fallow. There are sound theoretical reasons as to why the yields should be high, but the practice probably throws a somewhat greater strain on the stores of humus in the soil than winter fallow.

The usual practice is to either disc, scarify, or plough the land in January, February, or March, and re-scarify in July. Stiff clay land or cementy soils are obviously not suitable for summer fallowing.

Mr. Blackwood's Profitable Pasture, Kiata East.
(Paddock of 150 acres of mixed grass, sown down with a light seeding of Wimmera rye grass, 1919.)

Depth of Ploughing and Take-all.

Pioneer settlers thirty years ago in the Wimmera, adopting old world ideas, ploughed the soil deeply. Their thoroughness was misplaced. The deeply ploughed soil could not be consolidated, and often the raw subsoil was exposed. The trend to-day is to fly to the other extreme. The land is often merely scratched. In some districts there is even a tendency to replace the plough by the scarifier almost entirely.

When the subsoil is close to the surface the ploughing must inevitably be shallow, but there are large areas of the best land in the Wimmera where that does not apply. Should these soils also be scratched? There are some decided advantages in favour of shallow ploughing; more work can be done, and there is never any difficulty in securing that consolidation of the under layers of the soil which experience has shown to be a prime factor in securing good yields on the black lands of the Wimmera. But has not the practice some

drawbacks? Does it not, for instance, place an unnecessary strain on the surface layers of the soil, and, equally important, is it not conductive to the persistent outbreaks of take-all, which cause such serious losses in our crops year after year? The experience of some of those farmers who carefully plough their land rather deeper than most would suggest that such might be the case.

Two of the most consistent wheat-growers in the Wimmera are Messrs. R. Blackwood, of Kiata East, and W. E. Dahlenburg, of Salisbury. Their crops are almost always heavier than most, and rarely is a sign of take-all to be seen in their crops. They plough deeper than the average. Mr. Blackwood's practice is to plough his black land to from 4 to 5 inches deep whenever a favorable opportunity presents itself, such as in a wet year. He never ploughs the same paddock so deep twice in succession, on the second occasion the depth would be to 3½ inches. The object of the deeper ploughing is to

View of Experimental Plots at Salisbury.
(Average yield for 7½ acres, 48½ bushels per acre.)

completely bury all straw left after the stubble burn, and to reinvigorate the surface layers of the soil.

Mr. Dahlenburg's winning crop was grown on fallow ploughed to a depth of 4 to 4½ inches. He likes to get down to that depth when opportunity offers. Rarely do the fallows on these farms show any signs of half-decayed straw lying on the surface. It is all carefully buried below, rotted and incorporated in the soil. Can it be that this is the secret of these crops being practically take-all free? The rotting of the straw suggests the ready germination of the take-all spores which adhere to the straw at its butt. One can conceive that the working of these fallows after rain would germinate the remaining spores, and in the absence of the host plant, such as wheat or barley grass, their death would follow in due course.

Deep ploughing, however, requires doing with careful judgment; it is certainly dangerous in the hands of the unskilled farmer. There

are large areas of country in the Mallee and Mallee fringe where it could not be applied.

Increased Seeding and Manure.

Five or six years ago the standard seeding at Nhill was 1 bushel of wheat with ½ cwt. superphosphate. It is safe to say that to-day the average is 1¼ bushels of seed, and the manure nearer 100 lbs. than 56 lbs. The Nhill Agricultural Society can claim credit for the change. It is a direct result of the competitions. The winning crops during that time have been practically all heavily seeded and heavily manured.

The experiments at Longerenong College supplied the hint that the farmers have not been slow to put into practice. The experiments upon which the advocacy was based have been continued for a number of years. There have been occasional fluctuations, but there is no doubt about the final conclusions. That dependence cannot be placed wholly on results for one year only is shown by the results this year of the manurial tests at Salisbury. The yields on all these manurial plots were phenomenal; they would average close on 50 bushels per acre for 5 acres. The no manure plots yielded unexpectedly well; they surprised all who saw them. None of some twenty-three guesses made by farmers at the field day was closer than six bags per acre to the yield of the no manure plot, which averaged 47½ bushels per acre. A ½ cwt. of super. raised the yield to 49 bushels, and 1 cwt. to 50 bushels. But ½ cwt. of super. at Longerenong College as an average for eight years has raised yields by 6 or 7 bushels per acre, and 1 cwt. by 9 or 10 bushels. It is expected that the manurial plots at Salisbury will show similar differences as the years go by.

I wish, in conclusion, to again thank the secretary, Mr. Charles Towns (who has organized these competitions capably each year from their inception, twenty-one years ago) for his energetic assistance, and also the various competitors and members of the society for their cordial co-operation.

TETANUS, OR LOCK-JAW IN HORSES.

Tetanus, says the South Australian Assistant Government Veterinary Surgeon, is due to the Bacillus Tetanus gaining access to the body. The common mode of infection is usually through a wound. The source of infection is usually earth, street manure, or stable manure which contains bacilli and spores. When these gain entrance through a wound tetanus is produced. The entrance of foreign bodies, such as splinters of wood contaminated with soil or dust containing organisms; cobwebs, hay dust, may also prove carriers of infection. Prevention is obvious from the above facts. Do not neglect wounds, especially punctured wounds; also examine for foreign bodies in wounds, afterwards treating with suitable antiseptics, as carbolic acid solution. Pricks in the foot, crupper abrasions, saddle galls are commonly associated with the disease. Treatment, when established, is problematic as to results. Seek for any wounds, injury, and vigorously treat the parts with a strong antiseptic. Keep the patient quiet and in a darkened stable.—*Journal of Agriculture*, South Australia.

NEW ZEALAND FLAX.

(Continued from page 88.)

By J. Farrell, Orchard Supervisor.

Washing, Draining, Drying, and Bleaching the Fibre.

In order to produce fibre of the finest quality the thorough washing of same immediately after passing through the stripper and before being spread out to bleach is essential. By this means all the loose vegetable matter, gum, &c., are removed, and the "bitter" principle of the plant is eliminated. The whiter the fibre, due to the elimination of these ingredients before being placed on the bleachery, the better the quality; whereas, the finished product containing a quantity of these will vary in shades of yellow, according to the amount of deleterious matter remaining in the fibre. It will be understood, therefore, that the matters to be washed out contain elements which stain the fibre, and, as they adhere with considerable tenacity, mechanical force is applied to effect the washing in a necessarily short time, and immediately after the Phormium leaves the stripper.

In passing through the stripping machine, no matter how perfect the adjustment of its parts may be, a certain percentage of the elongated cells of the fibro-vascular strands is punctured or otherwise injured. As well as cleaning the fibre generally, prompt and thorough washing dispels the objectionable elements which would otherwise enter the injured parts and subsequently cause discoloration.

Before further considering the washing process it might be well to give an analysis of the green leaf made by Professor Church. The results, he states, are by no means complete, yet the writer considers same sufficiently comprehensive for the purposes of this article. It is as follows:—

"The plant analyzed contained .. 71.95 per cent. of water.
28.05 per cent. dry matter.

100.00

This dry matter contained 100 parts—

Fixed oil and fat (soluble in ether)	2.55
Resin and chlorophyll (soluble in alcohol)	3.24
Gum, and matters soluble in cold water	17.29
Starch, and matters soluble in hot water	4.28
Albuminoids	5.05
Ash and mineral matters	5.56
Cellulose and fibre	44.47
Other substances not determined	17.56
	100.00".

Hector gives an extract from Mr. William Skey's report dealing with the "bitter" principle of the Phormium plant as follows:—

"This was found to be a non-nitrogenous, non-crystallizable body, of a pale-yellow colour, feebly soluble in water, more soluble in alcohol, and capable of being absorbed by charcoal, and from which it can be dissolved by alcohol. It refuses to form salts with

Plate 22.—The Washing Machine: water running.

acids as bases; it has all the character of a natural substance. It is entirely removed by the repeated washing of the bruised leaf in water. In its concentrated form it is very pure and intense bitter, and might be used, perhaps, to communicate a bitter taste to beer, in the absence of hops. It would at least be less objectionable than drugs that are said to be used for this purpose."

The gum is only slightly soluble in cold water, but, when the stripped fibre is squeezed between several pairs of iron rollers in passing through the washing machine, it is effectively removed.

The above results of analysis, &c., are intended to give the reader a clearer idea of the nature of the substances washed from the fibre after the stripper has done its work.

Plate 22 gives a view of the washing machine employed in Nobelius' mill. This machine was invented and patented by Mr. H. B. Murphy, the manager, and he claims that it is superior to any other make in use. Its superiority consists in being capable of effectively removing all the gum and green sap from the fibre by means of its perfected roller system working under water in the bath beneath the shower. An abundant supply of water is maintained, and the water is delivered by a 4-inch pipe into the shower, which is made of galvanized iron with numerous perforations in the bottom. The bath receives a constant flow of fresh water, which, on becoming laden with gum, green sap, and vegetable matter, passes on to the settling drain.

The stripper works on the floor above the washing machine and the catcher deposits the Phormium on a conveyer at the point marked X. This short conveyer delivers the Phormium into a galvanized iron chute down which running water causes it to slide and pass between twenty-seven pairs of iron rollers in the bath. Each pair, operating on the principle of the clothes wringer, works parallel to the others and fairly close together, so that the fibre is conducted automatically between each and every pair of rollers. Considerable pressure is employed to enable the rollers, as the Phormium passes through, to squeeze out all the gum and green sap, and to thoroughly bruise the tails. The necessary pressure is obtained by the employment of spiral springs, one being placed at each end of every pair of rollers, and the tension is regulated by screw adjustments. The bruising of the tails in this manner enables the scutcher to deal effectively with them, and thus obviates the work of cutting them off as hitherto practised.

Mr. Murphy was a competitor for the New Zealand Government's bonus of £12,000 offered for improved methods of treating *Phormium tenax,* and the following is the Commissioners' report on his machine* :—

"H. B. Murphy, Waikawae, was visited on the 16th July. This is a process for washing and softening the tails, and is, in the opinion of the Commissioners, a machine which gives great promise of being a benefit to the industry. A practical demonstration was given, and the resultant fibre was most satisfactory. The Commissioners recommended that the patentee receive the sum of £500 to enable him to perfect his machine."

* Report, *Journal of Agriculture,* New Zealand, October, 1914.

This is the machine which, having been perfected at New Zealand's expense, is now installed in the Emerald mill, and the fibre treated by it is of excellent colour and good quality. The shaft to the right worked by the belt shown on its pulleys operates the machinery of the washer, and the fibre, after passing through the roller system, is delivered on to the conveyer to the left in the picture.

An operator removes the fibre from the conveyer, makes it into field-hanks, and places these on poles made of 3 in. x 2 in. Australian hardwood, which slide on greased bearers made of like material and of similar dimensions, with upright supports as illustrated in Plate 23. While the desired amount of fibre is being placed on each pole the hanks are further washed by fresh water from an overhead, horizontal 1-inch pipe with perforations underneath. In removing the treated Phormium from the conveyer and making it into hanks, the operator is careful not to mix the fibre "tails and butts," as in this undesirable

Plate 23.—Washing the hanks: tails showing.

condition its handling in the paddock, and subsequent treatment by the scutcher would be rendered much more difficult than when neatly hanked as in the illustration wherein the tails are showing.

Each pole when loaded is slid along the bearers into the draining compartment, where the fibre is allowed to remain for about 24 hours before being transferred to the paddock. Plate 24 illustrates a pole of field-hanks in the draining compartment with the butts showing.

When removed to the drying paddock, which for this purpose is laid down with grass, the hanks are distributed at intervals, and afterwards spread by hand in lines as shown in Plate 25. The fibre is allowed to remain in this position for about four days, according to weather conditions, and afterwards placed on the wires to dry; this phase of the paddocking treatment being also shown in the illustration. When thoroughly dry the fibre is made up in convenient bundles, each containing about nine field-hanks, and returned to the mill to be scutched.

Scutching, Grading, and Baling the Fibre.

The scutching process consists of removing the adherent particles of bleached vegetable matter, the scutcher-dust and tow from the fibre. During this operation the fibre is also burnished, thus made soft and given a silky appearance. The scutcher-drum is made mostly of timber (Australian hardwood), and constructed on the prinicple of a paddle wheel, and armed around its circumference with six horizontal wooden beaters, which travel at a speed of about 275 revolutions per minute. A small quantity of fibre is scutched at a time by inserting same, butts first and then tails, in the aperture as shown in Plate 26. The fibre is held firmly against the lower jaw of the aperture, while the beaters operate on the portion inside. The end of the fibre being treated is kept in contact with the scutcher by a wooden support with a concave in line with the sweep of the beaters, and about 1½ inches away from them. As the beaters operate the larger particles of

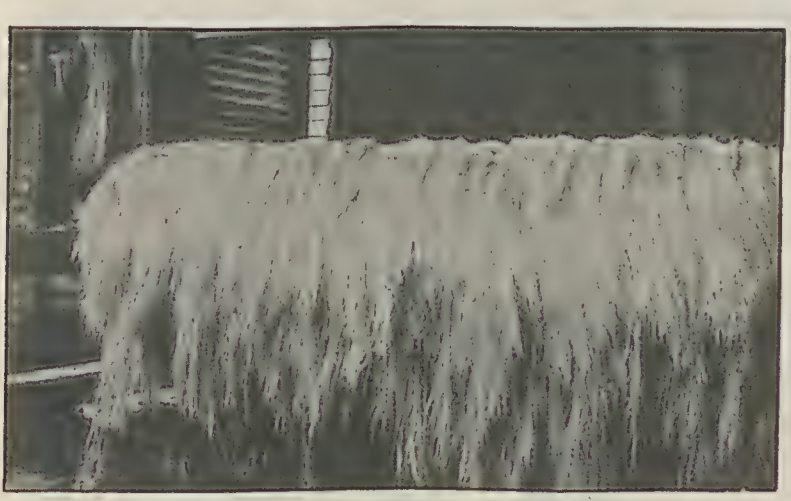


Plate 24.—Draining the hanks: butts showing.

bleached vegetable matter and the tow removed from the fibre remain in the scutching chamber, while the scutcher-dust is blown through a narrow duct into the open.

That the soft vegetable matter of the Phormium is amenable to bleaching as well as the fibre is illustrated in Plate 27. Fig. 1 shows a quantity of this substance removed from the fibre by the scutcher, and its shade of colour may be compared with that shown in Fig. 2 which is unbleached. Certainly the latter was not washed, as it was taken from the pit beneath the stripper and allowed to dry in the green state, but if exposed to varying weather conditions this also would bleach almost white.

The sample of Emerald fibre exhibited in Plate 28 is over 10 feet long, and demonstrates conclusively that when all the details involved in its preparation receive careful attention this Victorian product is in its general make up all that can be desired.

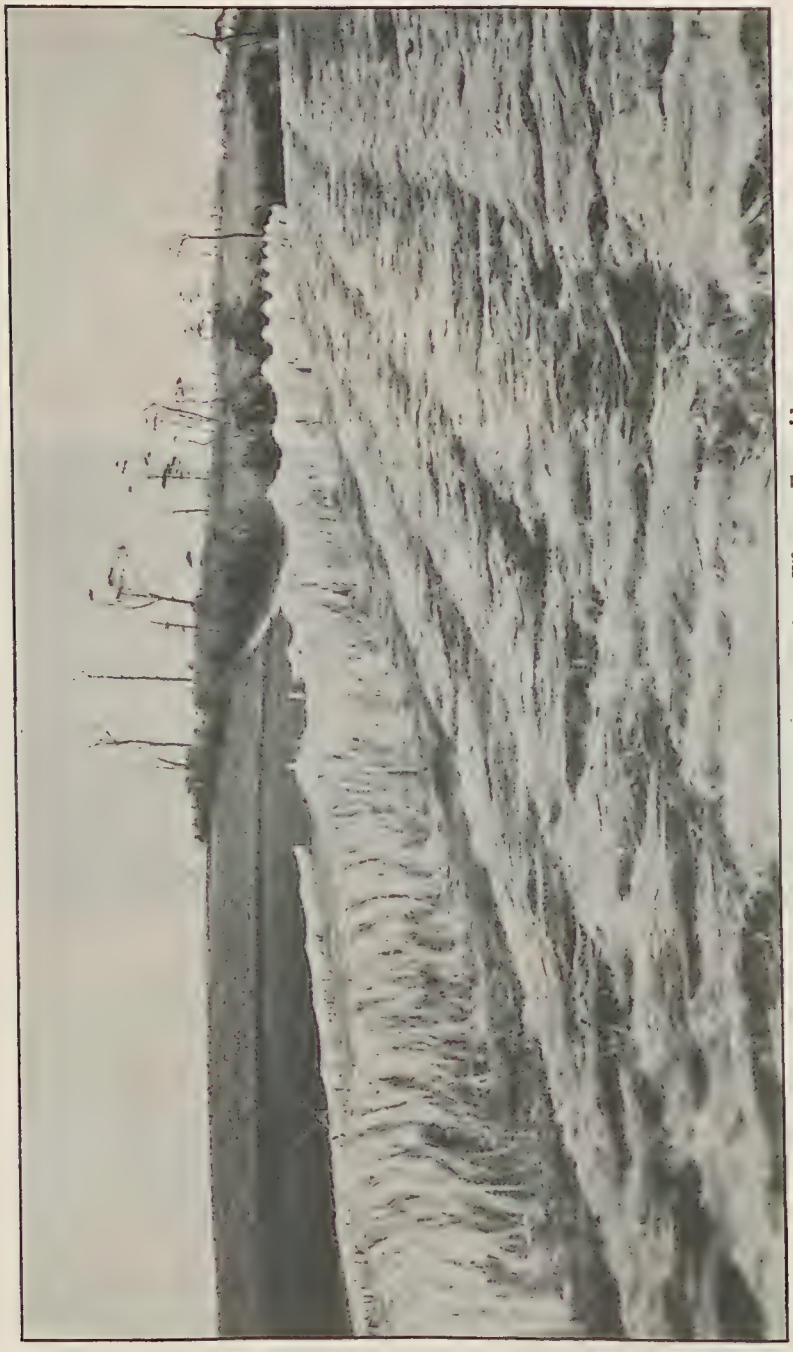


Plate 25.—"Paddocking" Phormium Fibre at Emerald.

The following report dealing with New Zealand flax grown in Victoria appeared in the *The Age*, 27th January, 1921:—

"There is at present an interesting sample of Australian-grown New Zealand flax on view at the offices of the International Harvester Company, Bourke-street. It was grown by Messrs. Nobelius and Son, of Emerald, and it utterly disproves the contention that New Zealand flax cannot be grown in Victoria with any commercial success. The fibre is very strong, and the growers find its cultivation a good business proposition. Some time ago at Drouin an area was sown with New Zealand flax, and alongside was a crop from Victorian-grown seed, which had become accli-

Plate 26.—Scutching the Bleached Fibre.

matized. The Victorian-grown seed was successful, but not the New Zealand. This seems to indicate that the wrong climate or soil was used for the New Zealand variety. Anyway, Messrs. Nobelius have been growing New Zealand flax for some years, and have from 70 to 90 acres under cultivation. The yield is about 2 to 3 tons an acre. The flax is sold locally, and made up into binder twine. Under the Commonwealth Bounties Act of 1907 a bounty of 10 per cent. of the market value of all products from flax grown in Australia was provided, but unfortunately for Messrs. Nobelius the Act expired in 1917, just before they harvested their first crop, and, although they made application for the bounty, did not receive it. The Commonwealth authorities have, however, visited the farm and expressed their admiration of the flax grown. Messrs. Nobelius are going on with the cultivation of flax, despite their bad luck in missing the bounty."

To the perfect working of the machinery employed in its treatment may be largely attributed Nobelius and Sons' success in producing this

high class product. In the washing process all the deleterious extractive matter, which would otherwise darken the fibre when bleaching, was eliminated, thus rendering it more easily burnished by the scutcher.

The following extract is from a report by Professor McNab on the microscopical character of prepared fibres of New Zealand flax:—

"The fibres of *Phormium tenax,* which are used in manufacturing purposes, consist of the prosenchymatous wood-cells, which form part of the fibro-vascular bundles existing in the plant. In this way the Phormium is perfectly distinct in its anatomical and physiological character from Irish flax and Russian hemp. In the plant the prosenchymatous wood-cells exist in bundles, composed entirely of these cells, but much more frequently mixed up with a number of other cells or vessels. The bundles are thus of a very different value, some containing much valuable fibre, while others contain comparatively little. When examined with the microscope the ultimate prosenchymatous wood-cells appear

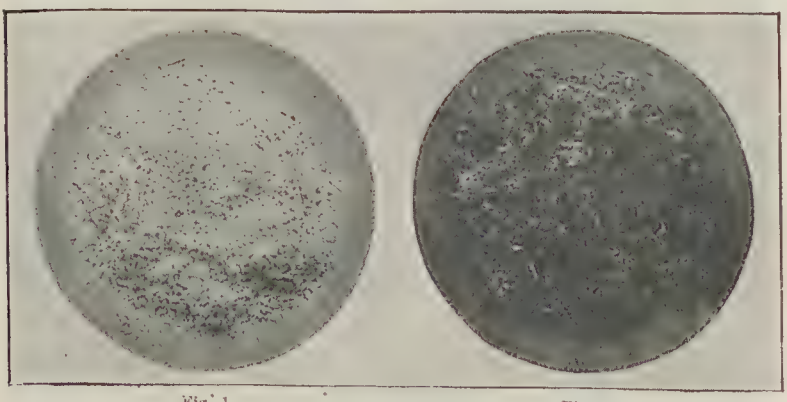


Fig. 1. Fig. 2.

Plate 27.—Portions of Vegetable Matter.

Fig. 1.—Bleached matter removed from the fibre by the scutcher.
2.—Matter removed from the leaf by a stripper, and unbleached.

as elongated, more or less cylindrical fibres, tapering towards each end, the tapering ends of the cells overlapping. The length of these cells is very difficult to determine, and all attempts to isolate a single perfect cell have as yet failed. They must, however, be of considerable length, as several cells have been traced for 2½ inches. The cell when isolated and viewed from the side appears as a transparent cylinder with a cavity. The relative sizes of the cells and of the cavity vary very much, and measurements of many fibres are given in this report. The measurements were obtained by using the *camera lucida,* and are expressed in fractions of an English inch. The microscope was fixed so that when a power of 500 diameters was used 1-1000th of an inch in a stage micrometer was magnified to half an inch. Each fibre was carefully drawn, and by means of an ivory rule and compass the size of both the fibre and the cavity could be ascertained with the greatest accuracy. In transverse section the cells appear more

or less polygonal, and possess well-marked pores or pits on the wall. These pits are very small, and not very numerous, the pit on one cell always corresponds with another on the next cell. The wood-cells making up the fibres of Phormium are thus porous and pitted cells. The pits are best seen in thin transverse sections of the fibro-vascular bundle, and require a power of 500 diameters for their demonstration.

In structure and general appearance the fibres of Phormium resemble those of Manila hemp, while they entirely differ from those of Irish flax and Russian hemp. Both Russian hemp and Irish flax consist of bast-fibres, the fibre both of Manila hemp and Phormium being the prosenchymatous wood-cells of the fibro-vascular bundles."

Professor Church gives the results of experiments to determine the amount of moisture and of ash in seven samples of machine-dressed Phormium and other vegetable fibres for comparison as follows:—

"Percentage in various fibres of—

	Water.	Ash.
No. 8, Mr. Stonyer, Kaiapoi	12.49	.44
No. 9, Captain F. W. Hutton, Waikato ..	11.31	.59
No. 10, T. S. Macffarlane, Auckland ..	11.81	.53
No. 11, G. Booth, Waikoura Mills ..	11.81	1.09
No. 12, Rikys's process	11.91	.71
No. 13, McFarlane and Wilson, Whakatane	11.61	.63
No. 14, John Journeaux, Wellington ..	10.77	1.08

Other fibres—

	Water.	Ash.
Manila hemp	13.22	2.02
Russian hemp	10.47	1.44
Irish flax	10.76	1.23
Carded cotton	7.23	.11
Swedish filtering paper	8.85	.46."

After giving a number of results relating to the chemical analysis of Phormium and other vegetable fibres for comparison, Professor Church further states—

"The foregoing analyses enable me to present a tolerably complete idea of the constituents which go to make up 100 parts of one of the samples (No. 13) of dressed Phormium fibre—

Analysis.	
Water	11.61
Ash	.63
Cellulose, A	16.55
Cellulose, B	45.75
Cellulose, C	.70
Oil, partly volatile	1.08
Albuminoids	1.69
Gum, and matters soluble in water at 150 deg. C. ..	21.99
	100.00."

Owing to maintaining the different parts of the machinery in proper adjustment, and because of the precision with which all the details in connexion with the preparation of the Emerald Phormium were carried out, the resultant fibre is of great strength and good colour. Therefore, tensil weakness, broken fibre, dry leafy selvages or straws, and twisted or balled tails have been obviated.

When scutched the fibre is graded and made into bales by means of a wooden press, the inside measurements of which are 4 ft. x 2 ft. x 3¼ ft.; therefore, the content of a bale of fibre is 26 cubic feet, and weighs approximately 4 cwt. The bale is made up of ninety-eight

Plate 28.—A Sample of Fibre over 10 feet in length.

press-hanks, each of which contains about 6 field-hanks. The press-hanks are neatly made, and slightly twisted in the middle before being placed in the press, with the twisted parts at the ends as shown in the bale appearing in Plate 29.

The necessity for compulsory grading regulations in connexion with most kinds of products, and particularly those for export overseas, is

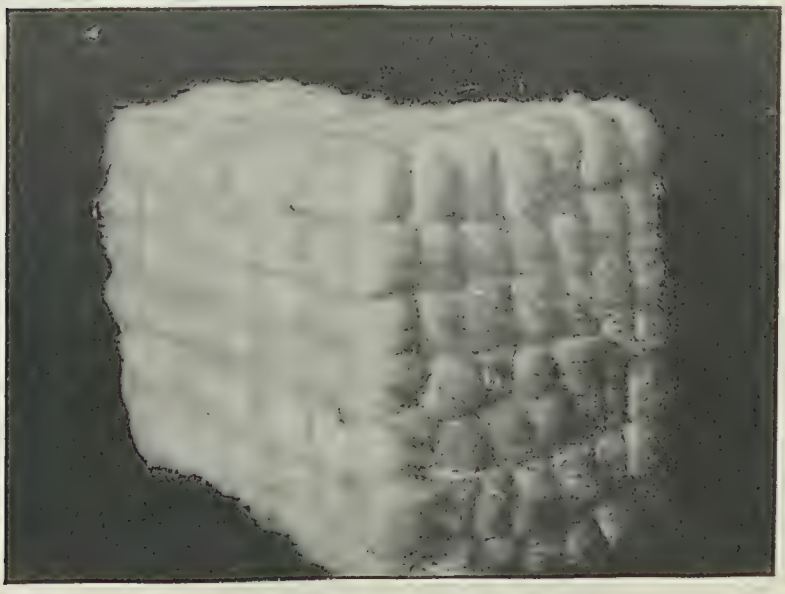


Plate 29.—A Bale of Fibre.

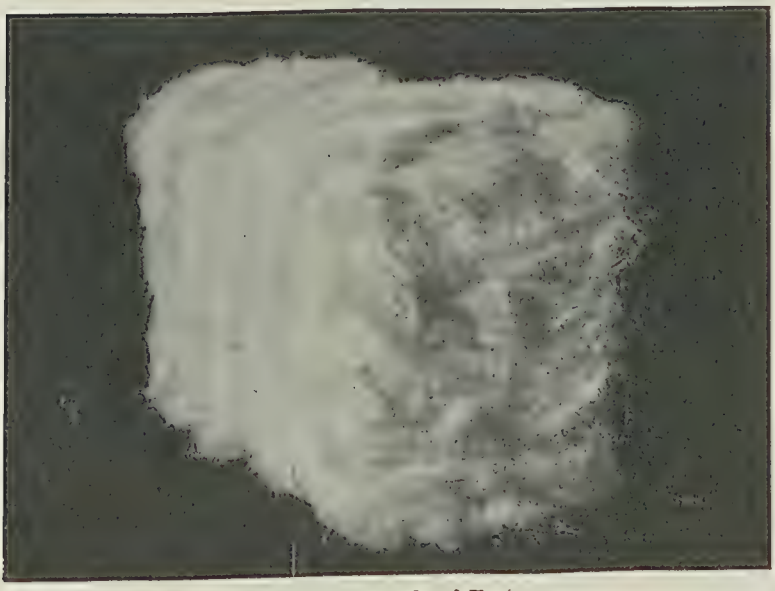


Plate 30.—A Bale of Tow.

now well recognised, and that these should be strictly administered under Government supervision is clearly understood. The latest Australian evidence of the necessity of an effective grading system is that revealed in connexion with the export of jams and canned fruits. New Zealand had a similar experience with its hemp industry prior to the inauguration of the grading system which now operates. Each bale must contain 450 lbs. of fibre, and for future identification it is numbered so as to prevent fraud or substitution. A tin label and a leather label, on each of which is stamped the miller's registered brand, are fixed at opposite ends of a piece of wire. The tin label is placed in the centre of the bale, and the leather one outside. The hemp is inspected at the port by the Government grader, who stamps the grade on the leather label. A certificate with the Harbor Board weights attached is then issued, and these are sent to the purchaser of the hemp, and he forwards them with the fibre to the spinner.

In showing the need for a compulsory grading system and the advantages which have accrued from its adoption, Mr. Joseph Leggins, president of the New Zealand Flax Millers' Association, in his pamphlet on the New Zealand hemp industry, published in 1912, has this to say—

> "The grading system has been the salvation of the industry, as before the Government inaugurated the system, which was done at the request of the millers themselves, the only system of grading was by the merchants or their agents; and as the price was regulated by the grade it is easy to understand that grave abuses crept in to the millers' disadvantages; also, absolute swindling took place at the mill. Stones, disused machinery, and refuse have been known to be packed in the centre of a bale, and bad quality hemp was also packed in the same manner. So at this time the spinner looked on the hemp with suspicion, and refused to buy. The industry was wiped completely out."

Another glance at the statistics will reveal, as Mr. Leggins explains, that the compulsory grading system has been the salvation of the industry, for therein we see that during the three years, 1916 to 1918 inclusive, 76,357 tons of fibre were exported, for which New Zealand received £3,586,884. And during the six years just prior to 1920 the average amount exported each year was 23,621 tons, the cash value being £913,441 per annum.

The combings removed from the bleached fibre during the scutching process is known as tow, and a bale of this is illustrated in Plate 30. The percentage of tow removed from the bleached fibre depends largely on the manner in which the stripper does its work. If this machine be kept in proper adjustment, so that the fibre is not cut, the percentage, as at Emerald, will be low—probably not more than 5 per cent.—whereas, if the stripper be working unsatisfactorily the percentage of tow is correspondingly high. The operators at the scutcher, too, must see that this machine works properly. In baling the tow, which when of good quality for making the cheaper kinds of cordage, &c., commands ready sale, it is not hanked like the other fibre, but the bales are made in the same press as the latter.

Fig. 1.—Flax grown for seed. Fig. 2.—Flax for fibre. Fig. 3.—Flax plant.

Plate 31.—Irish Flax (*Linum usitatissimum*).

Phormium Fibre Compared with that of the Linum Plant.

Much confusion still exists in the minds of many as to what constitutes the fibre of *Phormium tenax,* and that produced from *Linum usitatissimum,* and this confusion has arisen mostly through the name (flax) having been given to both fibres. Less confusion exists, however, since the Phormium fibre has become more generally known as hemp. To further elucidate this matter, the writer, having had practical experience in the cultivation and subsequent treatment of Linum flax, is putting in Plate 31 to assist in achieving this object. Fig. 1 shows the nature of a plant grown for seed, Fig. 2 a bed of the sort cultivated for fibre, and Fig. 3 depicts more clearly the plants' growth and habit of flowering.

It may be further stated that the Phormium fibres are the prosenchymatous wood-cells of the fibro-vascular bundles found embedded in and surrounded by the cellular tissue of the leaf; whereas, those of the Linum are bast fibres, a number of which, forming a closely packed layer, surround the tubular woody stem of the plant, and run parallel to it.

Now that the method of extracting the Phormium fibre from the leaf has been given in detail, it might be well to briefly explain here the process employed in liberating that of the Linum plant, the two chief factors in which are retting and scutching. Pit-retting, which has proved eminently satisfactory, consists of submerging the sheaves of flax in pits filled with "soft" water or that which is free from iron and other deleterious mineral substances. The sheaves are kept under water by means of weights, and by a process of slow fermentation lasting mostly from ten to sixteen days, according to the condition of the flax itself, and that of the water as regards purity and temperature, the gummy substance, which causes the fibres to adhere to the stems and to each other becomes dissolved. By regularly testing the straws a practical operator is enabled to determine how fermentation proceeds, and when the proper condition is reached the sheaves are removed from the pits, opened, and spread on a grass paddock to dry.

When thoroughly dry the flax is subjected to the process of breaking. This consists of passing the straws in small quantities at a time end-wise between two corrugated iron rollers which operate on the same principle as the feed-rollers of the stripping machine. By this means all the woody stems of the straws are broken and crushed into shives or fragments which, with the residue or dust of the gummy matter are later completely removed from the fibre by the scutcher.

Much might be said concerning other processes of retting, some of which have the effect of making the woody stems tough, and cause the gummy matter to "cook" and solidify when dried, making the fibre weak and rendering the process of scutching and hackling difficult; but what has been written will suffice for the purposes of this article.

(To be continued.)

STANDARD TEST COWS.

REPORT FOR QUARTER ENDED 30th DECEMBER, 1920.

The number of cows which completed the test during the quarter is 144, of which 119 attained to the standard required.

Individual returns are as follow :—

J. BAKER, Gheringhap. (Red Poll.)

Completed since last report, 2. Certificated, Nil.

C. BAMFORD, Benalla. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lupin of Medburn Grove ..	4859	6.2.20	273	20	4,761	4·23	201·20	175	229¼
Babe of Medburn Grove ..	Not yet allotted	22.3.20	272	16½	6,923	4·09	283·11	200	322¼

Mrs. IRENE BEARD, Outtrim. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Camellia of Springhurst ..	6200	25.2.20	273	16	4,088	5·57	227·82	200	259¾
Shadow of Luscombe ..	6143	15.3.20	273	14¾	5,724	5·64	322·69	250	367¼
Banksia of Springhurst ..	5387	20.3.20	273	18¾	4,932	5·60	276·45	250	315

Mrs. AGNES BLACK, Noorat. (Jersey.)

Completed since last report, 4. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Madge	3575	26.2.20	273	18¾	6,444	5·17	333·05	250	379¾
Mona's Pearl	3577	5.3.20	273	20½	7,022	4·79	336·65	250	383¼

CALLERY BROS., Bannockburn. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Roseleaf of Langley Park ..	4953	21.3.20	273	13½	6,316	4·52	285·36	175	325¼

J. W. COCHRANE, Moorabbin. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Myrtle of Springfield ..	4974	26.2.20	273	16½	6,791	4·81	326·68	200	372½

DEPARTMENT OF AGRICULTURE, Burnley. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Collingwood Beauty ..	Not yet allotted	11.3.20	273	16½	5,222	6·84	357·49	200	407½

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 7. Certificated, 6.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Hookah	Not yet allotted	14.1.20	273	13	6,383	3·80	243·59	200	277½
Dominion	,,	26.1.20	273	17½	4,229	4·46	188·48	175	214½
Epaulette	,,	2.2.20	273	16	5,484	5·06	277·40	200	316¼
Toronto	,,	26.2.20	273	18½	4,716	4·46	210·21	175	239½
Queen Elizabeth	,,	28.2.20	273	13	6,600	4·54	299·51	250	341½
Violation..	,,	20.3.20	273	20½	6,804	4·55	309·72	200	353

T. DOUGLAS, Ballarat. (Ayrshire.)

Completed since last report, 1. Certificated, Nil.

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 1. Certificated, Nil.

FLACK and SEWELL, Berwick. (Friesian.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Miss Muller 2nd of Berry ..	224	22.3.20	273	23	9,366	3·90	365·29	200	416½

W. A. FRANCIS, Kilcunda. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Red Rose of Fernhill ..	6349	19.2.20	273	16½	6,155	4·17	256·92	250	292¾

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Myrtle of Sparrovale ..	3905	8.1.20	273	19½	5,260	4·48	235·52	175	268¾
Primrose of Sparrovale ..	6359	12.1.20	273	19	4,198	4·75	199·42	175	227½
Belle of Sparrovale ..	3883	22.1.20	273	5	6,060	4·74	287·35	250	327½
Duchess of Sparrovale ..	3889	28.1.20	273	8½	6,795	4·06	274·82	200	313¾

W. C. GREAVES, Monomeith. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Letty 2nd of Warrook ..	6377	1.2.20	273	21	6,489	4·56	295·99	175	337½

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bluebell 2nd of Jerseyholm	Not yet allotted	20.3.20	273	20	5,903	4·83	285·07	175	325
Kirsty 8th of Jerseyholm	,,	23.3.20	273	19	5,962	5·12	305·18	175	347¾

W. HENDERSON, Grasmere. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lucy of Carracoorte ..	Not yet allotted	9.2.20	273	24½	5,201	3·97	206·61	175	235¼

J. H. HUNTER, Tyntynder. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Chevy 12th of Melrose ..	Not yet allotted	9.1.20	273	18	5,954	6·08	361·95	175	412½
Quality 8th of Melrose ..	,,	24.1.20	273	21	5,504	5·81	320·11	175	365
Rarity 11th of Melrose ..	,,	25.1.20	273	20½	6,479	5·63	364·84	175	416

J. HUTCHINSON, Somerville. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Thana of Somerville ..	Not yet allotted	23.2.20	273	21	5,965	6·02	359·12	175	409¼
Cloudy of Somerville ..	,,	23.3.20	273	23	6,651	5·60	372·36	200	424½

S. A. JOHNSON, Woodend. (Ayrshire.)

Completed since last report, 1. Certificated, Nil.

A. W. JONES, Whittington, Geelong. (Friesian and Jersey.)

Completed since last report, 13. Certificated, 12.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Friesian.—Completed since last report, 6. Certificated, 6.									
Norah's Pearl	363	4.2.20	273	22	7,860	3·61	284·03	200	323¾
Melba	Not yet allotted	6.2.20	273	21½	9,308	3·93	365·80	200	417
Bolobek Brenda	,,	21.2.20	273	25½	9,603	3·76	361·62	200	412¼
Queen Betty	,,	6.3.20	273	20½	8,115	3·79	307·70	200	350¾
Bolobek Rose	,,	13.3.20	*272	33½	11,148	4·03	448·81	250	511¾
Bolobek Bess	,,	15.3.20	*272	16½	9,913	4·28	424·32	250	483¾
Jersey.—Completed since last report, 7. Certificated, 6.									
Lady Grey 5th of St. Albans	5058	6.1.20	*263	16½	4,813	5·60	269·60	250	307½
Peeress of St. Albans ..	Not yet allotted	4.2.20	273	13	4,313	5·37	231·73	175	264½
Jubilee 15th	5056	5.2.20	273	26	8,729	5·44	474·63	250	541
Fairy Queen 2nd of St. Albans	Not yet allotted	13.2.20	273	11½	3,873	5·57	215·69	175	245¾
Bell of St. Albans ..	,,	19.2.20	273	8½	3,887	4·76	185·18	175	211
Beautie of Tarnpirr ..	6023	29.2.20	273	17	6,806	6.98	475.05	200	541½

* Withdrawn before completion of term.

J. KERR, Bacchus Marsh. (Shorthorn.)

Completed since last report, 5. Certificated, 3.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Morven Ruby 2nd ..	Not yet allotted	6.1.20	273	10½	6,401	3·79	242·73	200	276¾
Morven Queenie 8th ..	,,	17.1.20	273	25½	8,701	3·92	341·00	250	388¾
Morven Lizzie 10th ..	,,	27.3.20	273	10	6,618	3·71	245·90	200	280½

C. G. KNIGHT ESTATE, Benalla. (Jersey.)

Completed since last report 3. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Romany Girl 2nd of Tarnpirr	Not yet allotted	14.3.20	273	16½	4,715	5·14	242·66	175	276½

J. A. LANG, Alvie. (Ayrshire.)

Completed since last report, 7. Certificated, 5.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Docy of Riccarton ..	6497	7.2.20	273	20¼	6,308	4·08	257·21	175	293¼
Esme 2nd of Riccarton ..	6501	8.2.20	273	17⅝	5,709	3·84	219·16	175	249⅝
Dime of Riccarton ..	6496	11.3.20	273	11	5,566	4·68	260·50	200	297
Tabitha of Riccarton ..	6517	12.3.20	273	19	6,680	4·28	285·76	175	325¾
Peggy of Riccarton ..	6512	17.3.20	273	9	6,838	4·49	307·32	250	350¾

Mrs. E. M. LENNIE, Tongala. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Tulip of Bonshaw ..	Not yet allotted	12.1.20	273	15	6,994	4·84	338·41	250	385¾
Merella 2nd of Yarra Brae ..	5668	3.3.20	273	14⅜	4,553	6·76	307·87	200	351
Primrose of Bonshaw ..	Not yet allotted	5.3.20	273	19½	6,688	5·18	345·60	200	394
Myra	,,	10.3.20	273	21¼	8,158	4·44	362·66	250	413¼

AGRICULTURAL HIGH SCHOOL, Leongatha. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Alice	Not yet allotted	13.3.20	273	15¼	4,802	6·41	307·78	200	350¾
Surprise	,,	23.3.20	273	15	3,804	6·64	252·75	200	288¼

C. D. LLOYD, Caulfield. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Werribee Northwood Madeira 6th	Not yet allotted	6.2.20	273	21	6,728	6·33	426·10	200	485¼

C. G. LYON and R. R. KERR, Heidelberg. (Jersey.)

Completed since last report, 8. Certificated, 8.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lassie 7th of Banyule ..	6069	6.1.20	273	16	4,916	5·98	294·00	200	335½
Melford Mascotte	5215	8.1.20	273	21¼	6,082	5·88	357·43	250	407¾
Thora 4th of Banyule ..	6083	9.1.20	273	15½	5 709	5·43	310·21	200	353½
Zoe 5th of Warragaburra ..	1497	7.2.20	273	17⅓	5,672	5·73	325·02	250	370½
Statuette 2nd of Banyule ..	Not yet allotted	25.2.20	273	15½	4,637	6·05	280·37	175	319½
Silvermine 14th of Banyule..	5220	17.3.20	273	24	9 615	4·62	444·62	250	506¾
Dainty Maid of Holmwood	Not yet allotted	6.3.20	273	11	6,274	5·45	341·93	250	389¾
Molly of Clover Flat ..	5487	18.3.20	273	25	8,499	5·87	499·07	250	569

L. McFARLANE, Bundoora. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Peeress of Ayrbrae ..	5406	22.1.20	273	8½	5,107	4·99	254·92	175	290½

P. J. MALONEY, Tongala. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Balsam of Springhurst ..	4376	25.3.20	273	22	6,606	5·17	337·39	250	384½

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
La Charme	5248	19.12.19	273	29	7,487	5.51	412.60	250	470¼
Pibroch	5256	11.2.20	273	26	7,124	5·86	417·83	250	476¼

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gracie of Retreat	5386	10.1.20	*240	14½	5,388	4·99	268·85	200	306¼

* Sold before completion of term.

Mrs. L. ORCHARD, Grahamvale. (Jersey.)

Completed since last report, 1. Certificated, Nil.

R. RALSTON, Moglonemby. (Ayrshire.)

Completed since last report, 1. Certificated, Nil.

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 11. Certificated, 11.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Eidelweiss of Springhurst ..	Not yet allotted	5.2.20	273	17¼	4,188	5·32	222·99	175	254¼
Cornflower of Springhurst ..	..	12.1.20	273	20	4,662	5·22	243·22	175	277¼
Picotee of Springhurst ..	..	1.2.20	273	17	3,910	5·05	197·57	175	225¼
Nemophila of Springhurst ..	..	1.2.20	273	13½	3,918	5·37	210·27	175	239¾
Infanta of Springhurst ..	5396	22.2.20	273	14¾	4,899	5·22	255·99	250	291¾
Empress of Springhurst ..	Not yet allotted	12.3.20	273	8½	4,066	5·05	205·49	175	234¼
Clover of Springhurst ..	6201	15.3.20	273	9¾	3,595	5·73	206·01	200	234¾
Crocus of Springhurst ..	5393	17.3.20	273	14	6,454	5·26	339·55	250	387
Brighton Princess of Springhurst	5391	22.3.20	273	21	5,266	5·34	281·49	250	320¾
Begum of Springhurst ..	5388	26.3.20	273	4	4,643	5·48	254·38	200	290
Coleus of Springhurst ..	Not yet allotted	26.3.20	273	8½	2,720	6·58	179·09	175	204¼

Miss BRUCE REID, Bundoora. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Retford Fawn	3056	6.2.20	273	16	6,268	5·91	370·23	250	422
Jubilee Twilight Rambler ..	Not yet allotted	7.2.20	273	10	5,466	5·97	326·60	200	372¼
Mountain Mist of Kameruka	6210	26.2.20	273	21	7,058	5·40	381·37	250	434¾
Jubilee Red Rose	Not yet allotted	3.3.20	273	22½	6,558	5·43	356·15	200	406

Miss S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Kyora's Defender's May 3rd	Not yet allotted	15.1.20	273	7	4,052	5·22	211·60	200	241¼
Kyora's Merry Mike's Mayflower	,,	23.3.20	*251	14	4,350	4·54	197·59	175	225¼

* Withdrawn before completion of term.

J. H. ROGERS, Yarraville. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Minnie of Riverside ..	6825	4.2.20	273	15½	4,370	4·33	189·09*	175	215¼

* Attack mammitis, resulting in light quarter.

G. ROWE, Kardella. (Jersey.)

Completed since last report, 2. Certificated, Nil.

SADLER BROS., Noorat. (Ayrshire.)

Completed since last report, 7. Certificated, 7.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Clarice of Burnbrae ..	6839	6.1.20	273	14½	4,829	4·02	194·41	175	221¼
Lady Loule of View Point ..	4614	3.3.20	273	32	9,050	4·14	375·60	200	428¼
Lesbia of Yalart	3180	4.3.20	273	19	7,691	4·31	331·69	250	378
Rosalie of Yalart	6852	4.3.20	273	18½	7,909	3·66	289·76	250	330¼
Lotus of Burnbrae ..	6846	11.3.20	273	16½	5,603	4·14	232·25	175	264½
Nicety of Yalart	6850	13.3.20	273	19	8,228	4·32	355·37	250	405
Pearl of Burnbrae.. ..	4620	15.3.20	273	19½	8,227	4·17	343·16	250	391¼

AGRICULTURAL HIGH SCHOOL, SALE. (Ayrshire.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Young Perlaine of Ellerslie	2754	9.2.20	273	21½	8,252	4·64	382·75	250	436¼
Madeira Flinders	1740	15.3.20	273	10	7,005	3·88	271·58	250	309¼

A. H. S. SCHIER, Kernot. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Blanche 4th of Balvormie ..	4625	29.1.20	273	9¼	5,815	4·47	259·84	250	296¼
Phyllis of Glengowrie ..	4639	16.3.20	226	4	4,294	4·91	210·81	200	240¾

H. STONE, Cohuna. (Shorthorn.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Hillfield Maid	Not yet allotted	25.2.20	273	20	7,201	4·19	302·01	250	344¼
Baldwyns Cherry 2nd ..	„	5.3.20	273	10¼	4,708	4·13	194·53	175	221¾

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bolobek Belle	303	3.12.19	*272	10½	6,821	3·87	264·22	250	301¼
Domino's Hergeveld Belle ..	307	5.2.20	273	33	12,145	3·68	446·49	250	509
Queen of Friesland Park ..	304	7.2.20	273	41	11,998	3·53	424·07	250	483¾
Bolobek Amabel	317	11.2.20	273	21½	8,984	4·34	389·81	200	444½
Princess Ena	299	20.2.20	273	14	11,676	3·63	424·12	250	483½

* Withdrawn 1 day prematurely.

W. H. WAYCOTTE, Pascoe Vale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Perfection	4555	9.2.20	273	21	5,970	6·11	364·80	250	415¾

H. L. WEBB, Narrewarren. (Ayrshire.)

Completed since last report, 4. Certificated, 2.

Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rosebud of Holly Green ..	4782	12.1.20	273	11	5,020	4·14	207·60	200	236¾
Jewel of Holly Green ..	4770	16.3.20	*239	14	4,382	4·20	184·18	175	210

* Sold before completion of term.

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 9. Certificated, 8.

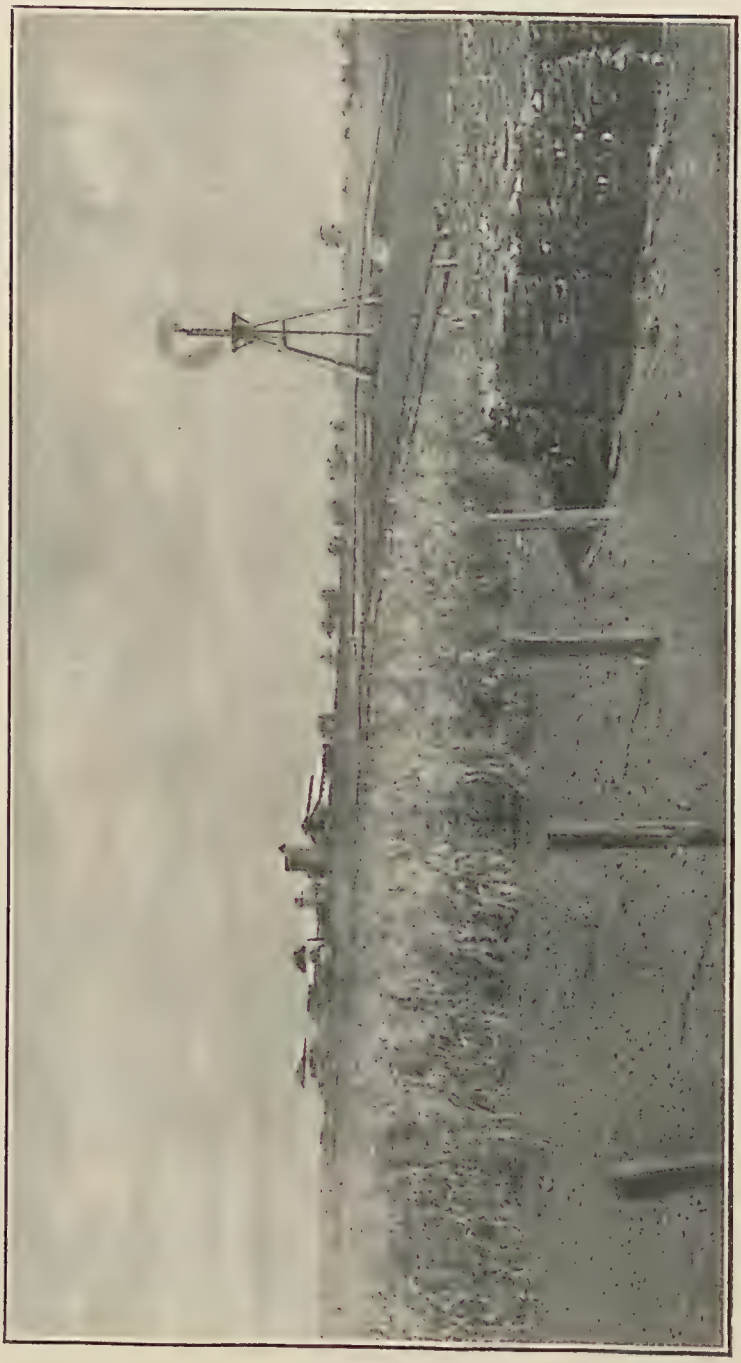
Name of Cow.	Herd Book Number.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Peerless 14th of Melrose ..	Not yet allotted	10.1.20	273	13½	4,140	6·87	284·52	200	324¼
Handsome Girl 7th of Melrose	5541	5.2.20	273	21½	6,256	7·13	446·16	250	508¾
Pearl 2nd of Melrose ..	3670	21.2.20	273	17⅜	6,302	5·43	342·54	250	390½
Laura 10th of Melrose ..	Not yet allotted	2.3.20	273	15½	4,346	6·50	282·52	175	322
Fuchsia 10th of Melrose ..	4516	2.3.20	273	21	8,261	4·37	360·73	250	411¼
Flower 11th of Melrose ..	6298	2.3.20	273	6½	5,700	6·45	367·93	250	419½
Graceful Duchess 10th of Melrose	3646	5.3.20	273	16½	5,458	6·46	352·73	250	402
Waverley Lass 3rd of Melrose	6312	16.3.20	273	16	6,043	6·53	394·78	250	450

GREEN FEED—MILK—MONEY.

By J. S. McFadzean, Senior Dairy Supervisor.

More milk will be obtained from half an acre of green oats and green maize than from 5 acres of ordinary grass land. Many farmers working to get the best returns from their cows know this, and make good use of it; but there are hundreds who do not. Some dairymen make far more than double the acre returns of others in hard cash just through that small paddock of green fodder. A large acreage of grazing appeals to some, but a good cultivation paddock will produce milk cheapest.

The man who depends on grass for his dairy herd cannot safely have his cows calving before the spring. He is always at the mercy of a late season. Then these spring-calved cows, without hand feeding, have a very short milking season. Only on strawberry clover flats or under lucerne grazing can spring-calved cows be made profitable without hand feeding. It is autumn-calved cows which will bring the



Green Feed—Milk—Money.

big profits to the dairy farmer, and cultivated fodder crops will keep them in milk until close up to calving again.

Half an acre of cultivation per cow and a silo full of surplus fodder puts the dairy farmer right ahead of any worry from a late spring or dry autumn. There are good grass years when the cows milk well and everything runs smoothly. A good flow of milk brings plenty of cash, and the bad seasons which have passed are forgotten in the hurry of making up for them. But it is then that every dairyman should be looking ahead so that he will not be caught again by a bad season with no feed.

For over fifteen years past the Dairy Supervisors of this Department have been continually talking to the farmers in their respective districts of fodder crops and full silos. When good seasons occur a farmer will decide he does not want a silo just then, and he holds off a little longer. Probably the next season finds him with no silos, no green feed, no milk, hungry cows, and perhaps, before the season is over, dead cows. The dairy farmer without a silo usually spends his lifetime making up in the good years for what he loses in the dry years. The man with the silo makes every year a good year.

There are over fifty dairy supervisors throughout the State talking to farmers of green crops and silos day after day, yet every dry season will find hundreds of farmers still unprepared. This Department has been advising on silo building, and building them on the instalment system for farmers when required for all these past years, and this work is still going on; yet there are very many farms on which losses of dairy cattle will occur in the very next dry season, just because the owners will not get busy on these lines. Instances frequently occur where supervisors have talked about green fodder and silage for six, eight, and even ten years before the farmer makes up his mind to act. The question then is, "How many times over has this man lost the price of that silo in milk, and perhaps also in cows that have been starved through his own delay.

In every part of the State where dairying can be done on grass land oats and maize will also grow well. In every dairying district outside the irrigation area some farmers are drought-proof because of their fodder storage; while others are living in a continual state of anxiety. Whenever the rain holds off for seven or eight weeks, and there is no green feed or silage to fall back on, the milk yield shortens and very soon stops; and the cream cheque always shrinks accordingly. To get milk from cows they must have green feed; an empty pocket goes with hungry cows always.

Mr. Farmer! Avoid that worry of no feed—no milk—no money by the use of the plough and the silo! Half an acre per cow will do it. Get right down to growing feed *now*, and order the silo *now!* Don't wait till the spring to arrange about the silo, for both yourself and the silo-builder will be too busy then. Communicate at once with your Dairy Supervisor, or write direct to the Department of Agriculture, Melbourne. *Don't be left again with a dry herd!*

PEACH GROWING IN VICTORIA.

(Continued from page 117.)

By A. G. McCalman, Orchard Supervisor.

VII.—Stocks.

Peaches and nectarines are almost invariably grown on seedling peach stocks, the stones being selected preferably from mid-season peaches. On the sandy soils near the coast about Geelong and Melbourne they do very well on seedling almonds, but the union of the stock and scion is not perfect, and sometimes a tree will break off at this point. Another objection to the almond stock is its liability to injury from excess of water, and this makes it unsuitable for irrigation districts.

Generally it is more satisfactory to obtain budded trees from a reliable nurseryman, but some growers, of course, prefer to grow them on stocks. These are referred to an article on fruit stocks by Mr. C. F. Cole in this *Journal* for June, 1911. The following extract is from the article mentioned:—

"Use stones from mid-season varieties. When the stones are obtained, open out a trench in fairly moist soil in a warm and sheltered position. Spread a layer of the stones in the trench about 3 inches in depth, and cover lightly with sand or soil. Continue this operation till the trench is nearly full, finally covering well over with soil. The stones should not be allowed to get too dry or too wet. When about to start planting remove the top soil, shovel out the stones, and sieve to remove any soil. The stones should be planted in May, June, or July in well-worked soil about 3 inches apart in the rows. The drill should be 1½ inches in depth, and the stones should be laid flat in the drill, and then covered with sand or light soil."

The rows should be planted 3 or 4 feet apart to allow room for cultivating by a horse implement, and after the seedlings appear they should be frequently weeded and hand hoed, and the surface between the rows well cultivated to keep the moisture in the soil. In January, if well grown, they will be ready for budding.

VIII.—Propagation.

Peaches and nectarines are propagated by budding the required varieties on to the seedling stocks. This operation should be performed in the months of January, February, or March, and both the stocks and the trees from which the buds are obtained should be in such a condition that the sap is flowing freely, and that the bark will lift readily. A few days after a fall of rain or after watering is a good time for budding, and cool and cloudy weather is best. As previously stated, it is generally better to buy from a nurseryman the budded trees ready for planting, but every grower should be able to perform the operation of budding, as it is sometimes desirable to change a variety after the orchard has been planted; or a tree may be broken off where it has been budded, and on its throwing up a new shoot from below this can be turned to account by budding it.

The operation of budding is very simple, and provided the sap is flowing freely and the work carefully done, there will be very few failures. If many trees are to be budded the operator should provide himself with a budding knife. This has a thin handle suitable for lifting the bark of the stock and pressing the bud into position. The blade must be brought to a keen edge on a whetstone and finished off on a strop. An ordinary pocket knife if given a keen edge may be used if only a few trees are to be worked.

To bud a seedling peach, select a smooth part of the stem 2½ to 3 inches from the ground. Make a horizontal cut across the stock through the bark to the sap wood. About an inch below this insert the blade of the knife, and make a vertical cut through the bark, running it up to meet the horizontal cut. Then take the shoot from which it is intended to bud, select a well-developed bud, remove the leaf, if this has not been already done, leaving a short portion of the stem of the leaf. Cut the bud off by inserting the blade of the knife about half an inch below it, and slicing it off, finishing the cut half an inch above the bud, cutting deep enough to remove a very thin slice of the wood on the under side of the bark of the bud. This operation should be practised beforehand until the operator is sure that he can perform it satisfactorily and quickly. The bud must now be inserted in a T-shaped cut made on the stock. With the thin end of the handle of the knife lift the bark on one side of the vertical cut, and run it down the cut. Then insert the lower end of the bud, and raise the bark of the stock on the other side of the cut, and press the bud down into position by means of the short stub left by cutting off the leaf. If the top of the bark of the bud projects beyond the horizontal cut in the stock, press the blade of the knife into the cut again, so as to remove the surplus. The bud is now in position and ready for tying with prepared raffia, obtainable from any seedsman. Start binding at the lower end of the cut on the stock, bind up to the bud and continue binding above the bud, leaving the latter exposed, and finish off above the horizontal cut with two half hitches. Be careful that the binding does not loosen when fastening. The whole operation should be performed as quickly as possible, so as to lessen the danger of injury to the cut surfaces by the drying effect of wind.

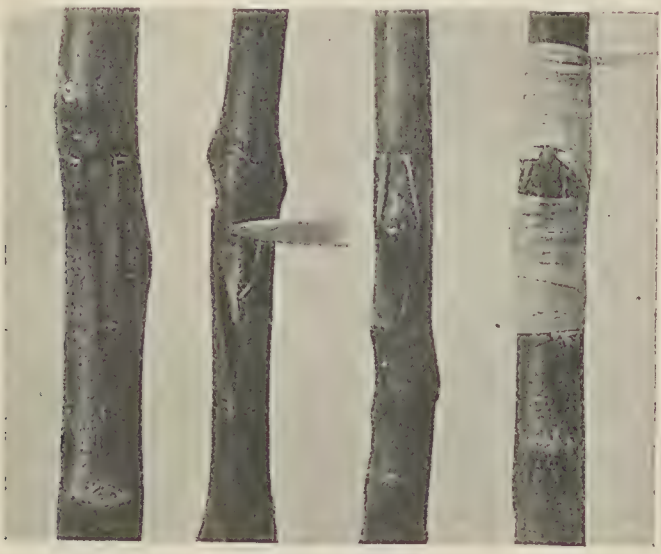
In a fortnight or three weeks' time if the stocks are growing well the binding should be removed, and in cases where the buds have failed to take new ones should be inserted, preferably lower down on the opposite side of the stock.

The shoots from which buds are obtained must be of the current season's growth, and should be well matured with the buds towards the middle of the shoots well developed. These well developed buds are the ones to use. Choose shoots from 2 feet to 2 ft. 6 in. long growing on the outside of the tree where, owing to their being well exposed to light and air, the wood has matured well for the time of the year.

When the shoots are obtained cut off the leaves and the sappy terminal ends, as these if left on draw sap from the shoots. They should then be wrapped in moist moss or hessian until used. The bud will later form the whole of the tree above ground; consequently, it is important to make a careful choice of the trees from which buds are

obtained, as the characteristics of the parent trees will be inherited by the buds obtained from them. Therefore, choose trees in full bearing and known to be heavy yielders, with healthy foliage showing no sign of peach-curl fungus. Perhaps it may be mentioned here that seedlings which fail to make normally vigorous growth are better discarded. In the nursery row all the seedlings would receive practically the same treatment, and if some have made poor growth it is probably due to inherent weakness.

In order to make the operation of budding quite clear illustrations are reproduced here from an article on the "Propagation of Fruit Trees," by Mr. C. F. Cole, which appeared in this *Journal* for October, 1911. Fig. 12A shows the stock with the T-shaped cut slightly opened



A. B. C. D.

Fig. 12.

A.—Incision ready for inserting bud. B.—Inserting bud. C.—Bud inserted. D.—Bud bound.

ready to receive the bud; 12B shows the bud being inserted; 12C the bud in position, and 12D the bud bound with raffia. Fig. 13 shows how the vertical cut is made in the stock; Fig. 14 the bark being lifted to enable the bud to be inserted, and Fig. 15 the method of slicing the bud from the shoots.

In the late winter the stock just above the bud must be cut off, otherwise the bud will remain dormant. For this operation expert workers use a keen-bladed pruning knife. The side of the foot is placed against the stock below the bud, the upper part of the stock grasped in one hand, and the blade of the knife placed slightly below the base of the bud on the opposite side of the stock. A clean sloping upward cut is then made, the stock at the same time

Fig. 13.
Position to insure a straight vertical cut.

Fig. 14.
Opening bark to receive prepared bud.

Fig 15.
Cutting a bud.

Fig. 16.
Cutting off stock. (Dotted line shows where cut should be made.)

being bent towards the body. The cut should finish off slightly above the bud. A leather legging is necessary on the leg held against the stock to prevent the danger of being cut. It would probably be better for a man not experienced in this work to cut off the stock with a sharp pair of secceteurs, and then smooth the cut over with the knife. The dotted line in Fig. 16 shows where the cut should be made.

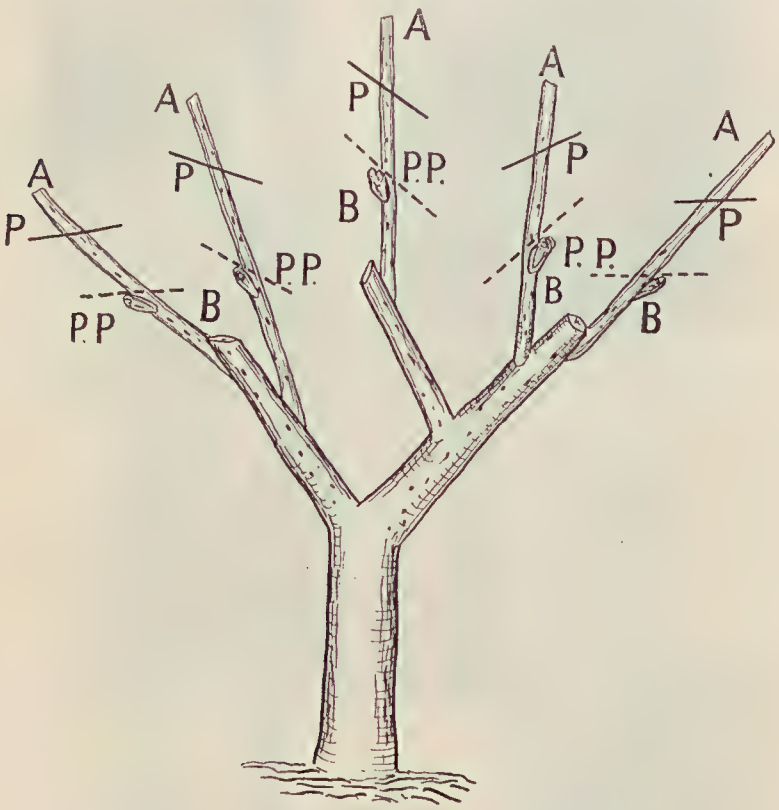


Fig. 17.

A.—Young shoots budded. B.—Inserted bud. P. Prune at lines P, and later at dotted lines P.P.

As soon as the buds begin to swell in the spring they should be sprayed with the copper-soda mixture, for the formula of which see this *Journal* for January, 1921, page 15, as a preventive for curl leaf fungus.

During the spring the bud will grow vigorously, and in addition a number of shoots will start to grow from the stock below the bud. These shoots should be rubbed off if soft enough, or if they have been

allowed to grow to any length they should be cut off cleanly against the stock. Care must be taken not to destroy the shoot from the inserted bud during this operation.

By the end of November the shoot from the bud should have grown to a height of about 22 inches, and it should then be shortened back to a height of about 16 inches in order to make it branch and form a head. This operation tends to force into growth buds lower down on the stem, and these should be trimmed off, leaving three or four of the strongest and best placed shoots at the top to form branches. In the following winter the tree will be ready for removal from the nursery and planting out in the orchard.

In order that a straight-stemmed tree may be obtained it is advisable to stake the shoot from the bud when it is about 9 inches long. Care must be taken when bending the shoot up for tying that it is not broken off, as the young wood is fairly brittle. Owing to the rapid expansion of the wood the ties should not be made too tight, and should be looked over occasionally in case some are cutting into the bark.

It is often necessary to bud over established trees in an orchard so as to change the variety, and in order to do this the trees should be headed back severely in the winter to induce a vigorous growth of shoots in the lower portion of the tree. In the following summer three or four of the best placed shoots are budded with the required variety.

The severe heading back of a vigorous tree will induce a great many more shoots to grow than are actually required for budding, and these should be thinned out in the spring, care being taken to leave at least double the number that will be actually required, as if too severely thinned the remaining shoots are more liable to be blown off, and the tree in any case would be weakened by the loss of too much foliage.

In the early spring the surplus shoots which were not budded should be pruned off, and the budded ones pruned about 4 inches above the inserted buds. This wood above the bud is left so as to form a support to which the shoot from the inserted bud may be tied until it is strong enough to support itself. All buds above the inserted ones must be destroyed. Later on when the shoots from the buds are strong the 4-inch stubs should be pruned off. (See Fig. 17.)

Another way is to prune at the inserted buds as described for nursery trees, and tie sticks to the shoots for supporting the young growth.

When heading back large trees in vigorous growth in order to produce shoots for budding, the tree should not be cut back so severely as shown in Fig. 13, as this would cause too great a shock to the tree. Three or four main limbs should be cut to a length of from 2 to 3 feet, leaving some of the lateral growth on to assist root action. In the following winter all the old wood above the budded shoots should be removed with a saw, and the cuts smoothed over with a sharp knife to assist the healing of the wound. Trees when cut back severely for the purpose of budding should have their trunks protected by bagging in order to prevent scalding of the bark while it is practically denuded of foliage.

HOME WINE MAKING.

By F. de Castella, Government Viticulturist.

(Continued from page 102.)

Sweet Wines.

In last issue only light dry wines were considered. For such the grapes should just have reached complete maturity; they must not be over-ripe. In the present issue it is proposed to deal with sweet wines for the making of which over-ripe grapes are far more suitable; for most types indeed they are indispensable.

Though light dry wines are most wholesome and desirable for family use, many Australians have a "sweet tooth"; these will ask whether it is not possible to convert their grapes into sweet wine.

Whilst it is quite possible to do so, the manipulations are certainly more complicated. The degree of over-maturity at which the grapes must be crushed being of very considerable importance, the use of instruments becomes necessary if definite results are to be expected. There are also difficulties in connexion with the fortification of wines of Port type which, although not insurmountable, will at first sight appear rather disconcerting.

The present article is not a treatise on wine making; all that is aimed at is to give a few simple instructions such as can be followed in the average home. These must therefore be limited to two distinct types, viz.:—

Fortified Sweet Wines.—To this class belong Port, Madeira, Marsala, the Spanish Moscatels, the Portuguese Muscatels, and most Australian sweet wines.

Natural Sweet Wines, in connexion with which over-maturity—natural or artificial—takes the place of the addition of spirit. Though not extensively practised in Australia, this is the method followed in the making of many French sweet wines; it is quite capable of application in the home, and can be depended on for as good or even better results on a small than on a large scale.

Sweet Wines by Fortification.

As the alcohol strength of the fermenting must or grape juice increases the vitality of the yeast organism decreases, until a point is reached at which it can no longer live, and fermentation ceases. This point cannot be rigorously fixed; it varies according to circumstances. Fermentation slackens considerably between 24 per cent. and 26 per cent. proof; it usually ceases at 28 per cent., though in exceptional circumstances it has been known to continue until a strength of 32 per cent. proof has been reached.

If, to a must in active fermentation, we add sufficient spirit to suddenly raise the strength to 32 per cent. of proof, or better still to

35 per cent., fermentation will absolutely cease, and any sugar still untransformed will remain as such in the wine, rendering it sweet.

Sweet wines of quality are only made from very ripe grapes. Since sugar is really potential alcohol it follows that the sweeter the grapes the smaller the proportion of spirit which it will be necessary to add in order to retain the desired degree of sweetness. Australian sweet wines are usually made from musts having a gravity of 15 deg. B. or over. (See page 93.) It is no doubt possible to make sweet wine from musts of much lower gravity; but it will be necessary to add much spirit and to add it early—before the sugar is all transformed and the wine has become dry. The result is, however, usually lacking in body and character. In Northern Victoria, in a normally warm autumn most varieties easily reach a gravity of 15 deg. Beaumé; as soon as the berries show signs of wilting or shrivelling this stage of over-maturity has usually been reached or even exceeded. In the cooler districts of the State, however, it will be found difficult to reach this point; hence sweet wines of quality can only rarely be produced near Melbourne, and the large proportion of spirit required will greatly increase the cost. It is true that artificial over-maturity might be taken advantage of as will be described in connexion with natural sweet wines. The actual manipulations in the making of the wine are much the same as those described in last issue for dry wines, but sweet wines—white as well as red—are usually fermented "on the skins," for a day, or even two, before being pressed. The following practical directions will serve as a guide:—

Pick the grapes when the must registers 15 deg. Beaumé or over. Crush and ferment exactly as described for dry red wine (see page 98). After active fermentation has proceeded for a day (or two days if deeper colour is desired) rack the partially fermented wine into another vessel (cask or jar), press the skins, and add the liquid thus obtained to the "first run." Test occasionally with the saccharometer. As soon as the gravity has fallen to 3 deg. or 4 deg. Beaumé fortify by adding wine spirit so as to bring the strength to 35 per cent. proof. This must be done in the presence of an Excise officer, who will make the necessary tests and calculations to determine the relative proportions of wine and spirit which must be mixed. Though wine made in small lots can usually be depended to keep sound at 32 per cent., it is more satisfactory to fortify to 35 per cent.

The following example will give an idea of the quantity of spirits usually required:—

Gravity of must when grapes were crushed, 16 deg. B.
Gravity of wine when ready to fortify, 4 deg. B.
Strength of wine to be fortified, 20 per cent. proof.

The quantity of spirit (65 per cent. overproof) required to bring the strength of 100 gallons of this wine to 35 per cent. proof would be 11.54 liquid gallons = 19.04 proof gallon.* Owing to the great difference between the gravities of wine and spirit, the latter has a tendency to accumulate near the surface, which would thus become stronger

* Though the actual quantity of spirit is only 11½ gallons, both spirit and excise duty must be paid for per proof gallon—100 liquid gallons @ 65 % overproof = 165 proof gallons.

than the lower levels. Thorough and prolonged stirring is therefore necessary to properly mix the spirit with the wine. Subsequent treatment is much the same as has been described for dry wine, though it is no longer necessary to so scrupulously protect the wine from contact with air. At 30 per cent. proof and over there is no longer any fear of acetic fermentation.

The chief difficulty in the way of making fortified sweet wine in small quantities is in connexion with the necessary spirit and its addition to the wine. According to Commonwealth law, grape wine spirit of a strength of not less than 40 per cent. overproof may be used for fortifying wine on payment of Excise duty at the rate of 6s. per proof gallon. The spirit can only be added to the wine under the supervision of an Excise officer. If spirit were used otherwise the full Excise duty at the rate of 35s. per proof gallon, chargeable on spirit n.e.i., would have to be paid.

Fortifying spirit can only be cleared from bond in quantities of 10 liquid gallons or over.† In the case mentioned above—quite a usual one—10 gallons would suffice for the fortification of rather over 100 gallons of wine. Possibly two neighbours might co-operate, clearing from bond, say, 10 gallons in one lot, and dividing it between them under an officer's supervision. It will be seen, however, that unless operating on a fairly large scale there are serious practical difficulties. The cost is also high. In addition to the 6s. per gallon duty there is the cost of the spirit—about 12s. to 14s. per proof gallon just at present. It is also scarce and difficult to secure in small lots.

Natural Sweet Wines.

The home wine-maker will find this method much simpler than the last, since fortification with the complication it entails is no longer required. On the other hand it is absolutely necessary to only crush very over-ripe grapes. The sugar content of the juice must be such that the alcohol resulting from fermentation reaches a sufficiently high percentage to check its further progress before all the sugar has been converted. Fortunately the juice of very over-ripe grapes usually ferments slowly, and this process ceases at a lower strength than that of moderately over-ripe grapes. The only difficulty is to obtain the requisite degree of over-maturity. The must should register at least 18 deg. Beaumé, and 20 deg. is to be preferred. On the Murray this can be achieved in a normally dry autumn by allowing the grapes to hang on the vine,‡ but in cooler districts artificial means must be had recourse to. The grapes must first be carefully picked, no berries being bruised or broken, which would permit growth of moulds; they may then be spread in a thin layer on clean straw on shelves in a well aerated room or shed. After a couple of weeks they will be found to have wilted, and on testing with the saccharometer a very marked increase in gravity will be noted.

† Section 48 of regulations under *Distillation Act* 1901–1918.

‡ In some parts of France over-maturity is hastened by twisting the stalks as soon as the grapes are ripe, but without detaching the bunch from the vine.

Another method, though a rather tedious one, is to hang the bunches on strings or wires stretched across a dry room. A better way, especially if fairly large quantities have to be dealt with, would be to construct something after the style of the drying racks in general use by sultana and currant growers at Mildura, Nyah, &c., by stretching tiers or shelves of ordinary rabbit-proof netting in a room or shed. On these the grapes are carefully spread out.

The length of time required to reach the desired degree of concentration will vary according to the weather and the climatic conditions of the locality. Near Melbourne it may need several weeks. When the grapes show definite signs of wilting crush a few bunches, and test with saccharometer. As soon as this shows a gravity of 18 deg. or 20 deg. Beaumé, crush and make into wine exactly as described previously.

Fermentation may be conducted for a couple of days in contact with the skins or, if a more delicate wine is desired, the grapes may be pressed immediately, and the must fermented separately as has already been described for dry white wine (page 96). If the weather is cold, as is often the case by the time the grapes are sufficiently overripe, the use of a starter is recommended. (See page 98.)

After pressing the must should be fermented in kegs or jars filled to within a small distance of the top. Fermentation will be gentle, but long and slow. After a couple of weeks, during which the aperture is closed with a vine leaf and slate, cork very lightly. Towards midwinter rack into vessels which can be kept quite full.

In the spring following their making, wines of this class may occasionally give trouble owing to secondary fermentations. This can be avoided by pasteurization in bottle or treatment on similar lines to that described for sterilized grape juice in last issue, but the wine must not be heated to so high a temperature.

Towards the end of August carefully decant off the lees, bottle, tie down corks, and sterilize in a boiler as described on page 101. Do not allow the temperature to exceed 169 deg. F., but maintain it at this point for an hour. Store the bottles on their sides, and the wine will keep indefinitely.

Such spring fermentation will not always occur, and if the wine is merely racked in August or early September, and only finally bottled a year later, it will be of higher quality. A sharp watch will need to be kept in spring and early summer, and on the first signs of trouble the wine should be bottled and pasteurized as described above.

Vinegar.

As was explained in last issue, grapes may also be converted into vinegar. Should this be the objective, they must, however, be first converted into light wine, preferably white, exactly as described on page 96.

The conversion of grapes into vinegar takes place in two distinct stages—(1) the transformation of sugar into alcohol—in other words, of grapes into wine; (2) the acetification of this alcohol or the conversion of the wine, first made, into vinegar.

To make good vinegar, the wine must be sound and free from disease organisms other than the acetic ferment; wine that has become pricked owing to neglect of filling up, and which is, therefore, undrinkable, is, however, capable of conversion into excellent vinegar. The wine must not be too alcoholic, since strong wines acetify with difficulty. The most suitable strength is between 14 and 16 per cent. proof. This corresponds to a must of which the original gravity was between 8 deg. and 9 deg. B. If the grapes were riper, the must could with advantage be reduced to this gravity by the addition of clear rainwater,* or the wine itself may be brought down to this strength in similar manner.

Acetification is hindered by antiseptics of any kind. Sulphur (or, rather, its so-called fumes), which is the mainstay of the cellarman for the sterilization of his casks, must be very sparingly used, if at all, in the making of wine destined to be converted into vinegar. Casks or jars which have been "sulphured" should be washed with clean water before being used for vinegar making.

Temperature has also an important bearing; below 50 deg. F. acetification is slow and difficult; it is most active between 86 deg. and 95 deg., but a better vinegar is obtained between 68 deg. and 86 deg.

Conversion into vinegar is a natural change which occurs automatically on exposure to air of a wine of suitable alcohol strength and free from antiseptic substances, nevertheless vinegar making is a regular process which will be dealt with in a subsequent article, since there are several directions in which art can come to the assistance of nature. It will suffice here to say that the wine originally made will become vinegar if kept in a vessel which is not corked so as to allow free contact with the air; it may be conveniently closed by tying a piece of hessian round the mouth of the jar so as to keep out insects, &c.

In the metropolitan area, the weather will, as a rule, be cold by the time the first or vinous fermentation is completely over, and it will usually be better to hold the wine over until the following spring before turning it into vinegar. Small quantities of vinegar may, however, be made immediately by keeping the jar in a fairly warm place—a kitchen, for example, or a warm room where the temperature is in the neighbourhood of 75 deg. F. The addition of a small proportion (about 1-10th of the bulk of the wine to be converted) of vinegar of good quality is to be recommended; though it is not indispensable. After a few months' time, the wine will be found to have changed into excellent vinegar.

* To reduce the Beaumé gravity 1° would need the addition to the wine of 1-10th of its bulk, of water.

FARM NOTES FOR FEBRUARY.

EXPERIMENTAL WORK AT STATE RESEARCH FARM, WERRIBEE.

By George S. Gordon, Science Field Officer.

Seasonal Conditions.

The weather during February was warm to hot, with little rain. These conditions, following the comparatively wet months previously experienced, have caused the ground to set hard. Consequently, ploughing stubble land for early grown crops, &c., has been difficult, and the soil has turned up lumpy. The fallows, too, have "set" to some extent; these have been cultivated, and a deeper cultivation will be given when the soil is in a better condition for working. Lucerene has made good growth during the month, and summer forages have also done well.

Green Manurial Rotation Field.

The soils of this farm, in common with some of the older cultivated lands of the State, have been depleted of much of their organic matter or "humus," and it is recognised that on the average farm there is not sufficient farmyard manure to make up the loss. Even if there were, the labour for distributing it is usually so scarce and costly that the extensive use of this manure becomes impracticable on wheat farms. This experimental field was, therefore, designed to test the value of "green" manuring by ploughing in and also feeding off suitable green crops in rotation with wheat as a means whereby the fertility of the soil can be improved and at the same time made to produce profitable crops. Four forage crops are under test in competition with adjoining plots where wheat is grown in rotation with bare fallow. The produce from the wheat plots grown during the past season has been thrashed, and the results for 1920 are now available. Those from the feeding-off tests are summarized in the following table:—

Table No. I.—Feeding-Off Tests.
Green Manurial Rotation Field, Season 1920.

Plot No.	Area Acre.	Crop, 1920.	Times Fed Off.	Period, 1920.	Per Acre.		Cash value per acre calculated at the rate of 1d. per day for wool and 2d. per lb. for the live weight increase.
					Sheep Days.	Live Weight Increase.	
						lbs.	£ s. d.
1	·95	Rape ..	1	Oct. 14–30 ..	202	30	0 9 2
2	·95	Barley ..	3	July 13–Nov. 8	619	477	4 12 4
3	·95	Peas ..	1	Oct. 14–29 ..	252	75	0 17 9
4	·95	Oats (Algerian)	2	July 22–Oct. 25	699	419	4 4 4

Note.—The live weight increase is determined by individually weighing the sheep "in" and "out" of the plots. The term "sheep days" means the number of sheep which one acre would carry for one day or the number of days which the same area would keep one sheep.

The Barley plot (No. 2) gave the best return this year, beating the Algerian Oat plot by 8s. per acre in the cash value, though the latter was easily the best in 1919. The success of the Barley this year may be attributed to the better germination and quicker early growth which this cereal made, permitting the plot to be stocked with sheep before the Oats. The low return from the Rape plot is accounted for by the fact

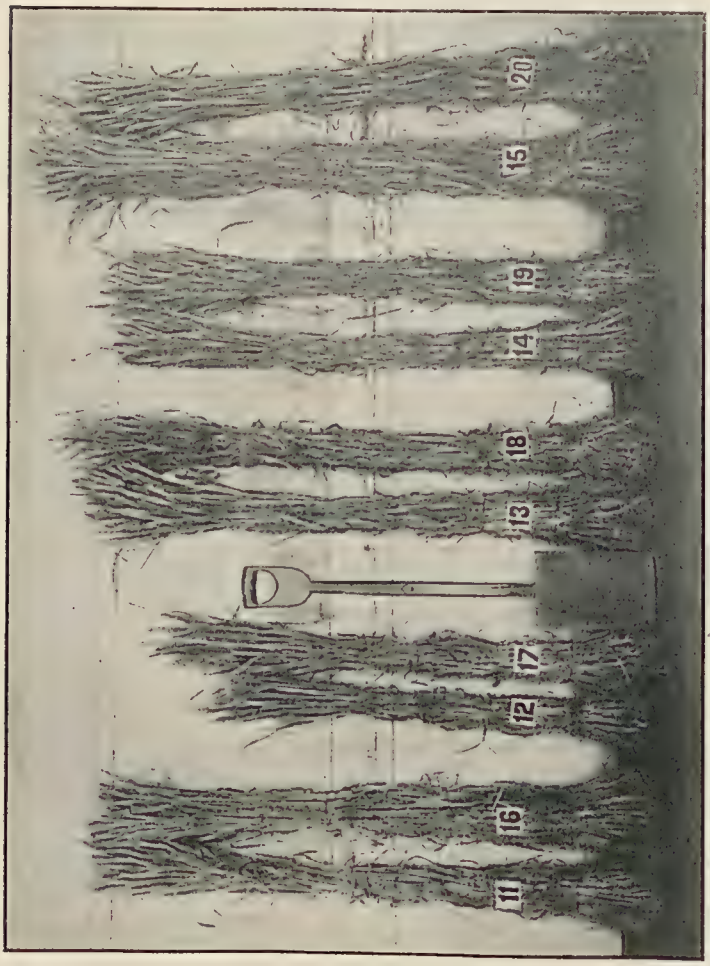


Plate I.—Representative green samples from one square yard in each wheat plot in Green Manurial Field 1920.

11. After rape ploughed in. 16. After rape fed off. 12. After barley ploughed in. 17. After barley fed off. 13. After peas ploughed in. 18. After peas fed off. 14. After oats ploughed in. 19. After oats fed off. 15. After manured bare fallow. 20. After bare fallow.

that this crop had to be sown three times. The first and second sowings failed to germinate satisfactorily under the dry conditions, and the few plants which grew were attacked by insects known as pea mites. In consequence, it was not ready for stocking with sheep till 14th October, and only one "feed" was obtained. Peas, also as usual, provided only one "feed." A comparison of the results for 1919 and 1920 with average for these years is given in table No. II.

TABLE No. II—FEEDING-OFF TESTS, 1919 AND 1920.

Crop.	Cash value per acre calculated at the rate of ¼d. per day for wool and 2d. per lb. for the live weight increase.		
	Season 1919.	Season 1920.	Average of two years.
	£ s. d.	£ s. d.	£ s. d.
Rape	2 7 11	0 9 2	1 8 6½
Barley	2 4 8	4 12 4	3 8 6
Peas	1 8 1	0 17 9	1 2 11
Oats	3 18 9	4 4 4	4 1 6½

Wheat Plots, 1920.

With the exception of those sown after Barley, most of the wheat plots looked particularly well right up to harvest, and it is to be regretted that at this time they were considerably damaged by wet weather. The plots are usually stripped, but the crop lodged so badly that it had to be cut and thrashed. By the time the land was fit to carry the reaper and binder the crop was so tangled and brittle that quite a large amount of grain was lost. Samples (1-500 of an acre in area) were carefully harvested by hand before the plots were cut. The results from these showed that about one-third of the grain was left on the ground, and that there is a possibility that some plots suffered more than others. However, a good idea of the appearance of the plots will be obtained from Plate No. I., showing representative samples taken in the green state from one square yard of each plot, and the actual yields are recorded in Table No. III.

TABLE No. III.—YIELDS FROM WHEAT PLOTS, 1920.

Green Manurial Rotation Field.

Variety—Yandilla King graded seed, pickled with 1¼ % solution of bluestone, and sown at the rate of 72 lbs. per acre, with 140 lbs. of super.

Plot No.	Treatment or Crop in 1919.	Crop 1920.	Yield per acre.
11	Rape ploughed in	Wheat ..	24 1
12	Barley ploughed in	,, ..	9 20
13	Peas ploughed in	,, ..	26 57
14	Oats ploughed in	,, ..	26 8
15	Bare fallow (manured similar to cropped plots)	,, ..	26 27
16	Rape fed off	,, ..	27 5
17	Barley fed off	,, ..	9 0
18	Peas fed off	,, ..	21 47
19	Oats fed off	,, ..	10 44
20	Bare fallow	,, ..	21 3

Both the yields per acre and the samples, clearly prove that the worst crops of wheat are those succeeding Barley. These plots were almost ruined by the fungus disease known as "Take all," and Plate

No. II. gives some idea of the appearance of the plots. The photograph was taken on 19th November, while the crops were still green. The strong, vigorous growth of the crop on the plots where Rape and Peas were grown, stands out in marked contrast with that on the Barley plot.

Prior to 1919, Rye and Vetches were used as the green crop on plots Nos. 14 and 19, and the following wheat crop was quite as bad as that shown in Plate No. II. The Rye (like Barley) seemed to carry on the "Take-all" fungus from one wheat crop to another. It was, therefore, decided to substitute Oats for the Rye and Vetches in order to test the resistance of this cereal to the disease. Seeing that the plots were known to be badly infested with "Take-all" in 1918, the Oats certainly seem to be making good. The wheat following Rape, Peas and Bare Fallow was comparatively free from disease, and the illustrations indicate the fine crops which were grown on these plots.

Plate No. I. also serves to illustrate the following points:—

(1) Wheat following the "fed off" green crops has made quite as good a growth as that on plots where similar crops were ploughed in.

(2) In this, a wet year (rainfall 21.69 inches) the crops following green forages—particularly Rape and Peas—compare favorably with those sown on bare fallow where only one crop is grown in two years.

(3) The result of the extra dressing of super. (similar to that which the green crops receive) is clearly shown in the sample and yield from plot No. 15.

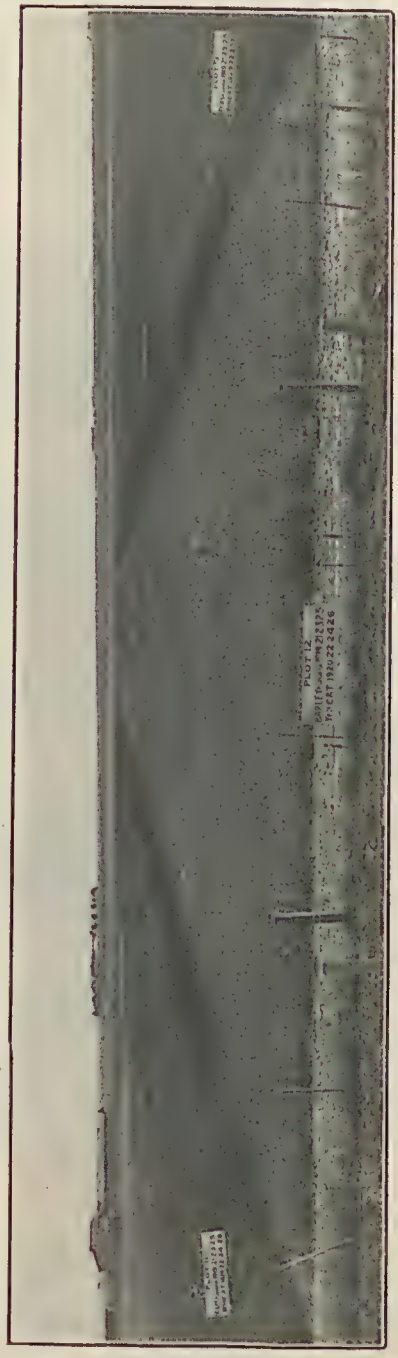


Plate II.—View of Rotation Field.

Summary and Observations.

The results to date may be summarized as follow:—

(*a*) The practice of growing a crop for ploughing in (green manuring) is unprofitable for wheat growing.

(*b*) The results seem to indicate that in districts with an annual rainfall of 20 inches, a suitable green crop, fed off with sheep, may give better returns than bare fallowing for wheat.

(*c*) The suitability of the four forages tested may be shown thus:—

Algerian Oats gave best feeding value; seems to be very resistant to—if not immune from "take-all"—and the succeeding wheat crop fairly good.

Barley gave second best feeding value, but succeeding wheat almost ruined by "take all," and generally contained some barley. Barley in wheat is more objectionable than oats.

Rape gave third best feeding value, and succeeding wheat was a clean, good crop, and gave a heavy yield.

Peas gave the worst value as feed, but succeeding wheat was a clean good crop, and gave a heavy yield.

(*d*) Under practical working conditions these results seem to suggest that a mixture of Rape with Oats and Peas should give good results as a forage crop.

(*e*) "Take-all" does not spread to any extent (note the clean crops adjoining the affected plot in Plate II.).

EXPERIMENTS WITH TOMATOES.

A recent bulletin issued by the Kentucky (U.S.) Experiment Station gives a summary of results from experiments carried out with tomatoes to determine the effect of various methods of pruning and staking on the yield, earliness of ripening and size of the individual fruits. From the results of three seasons' work, the author found that pot-grown plants were much more productive than flat-grown plants. Staking and pruning reduced the yield of marketable fruit per plant, but increased the yield per acre because of the greater number of plants that it was possible to set. Generally speaking, the yield per plant was in direct proportion to the number of bearing stems. On the whole, pruning to two stems gave the best results.

Pruning increased the size of the individual fruits, and pruned and staked tomatoes ripened approximately one week earlier than those that had been untrained. Plants trained to two stems, set 2 feet x 4 feet apart, yielded less per plant but much more per acre than similar plants set 4½ x 5 feet apart and also more per acre than untrained plants set 4½ x 5 feet. A range in length of stake from 4 feet 2 inches to 5 feet 6 inches had little on the total yields.

The writer concludes that it does not pay to stake and prune tomatoes for the canning factory, although it may pay in the home garden or in very intensive trucking areas. The cost of stakes, the additional labour involved, and the greater number of plants required may be the limiting factors for profitable staking and pruning.

MEAT MEAL FOR POULTRY.

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

An interesting experiment to determine the economic advantages of feeding meat meal to poultry has been concluded at the New Zealand Department of Agriculture's station at Milton. Mr. F. C. Brown, Chief Poultry Instructor, reports that twenty-four White Leghorn pullets of even type and of the same age were selected for the test, and divided into four pens of six each. The ingredients of the ration provided to each pen were similar in every respect, excepting that meat meal was included in the case of two of the pens (3 and 4). The test extended over a period of fifty-two weeks, commencing on 8th April, 1919. The results in egg yield and in cost of food consumed by each bird are as follows:—

PENS 1 AND 2. NO MEAT.

	£	*s.*	*d.*
Ground wheat, 332 lbs., at 6s. 8d. per bushel	1	16	10
Cost of grinding		2	6
Pollard, 108 lbs., at £9 5s. per ton		10	0
Bran, 218 lbs., at £7 5s. per ton		15	10
Whole wheat, 652 lbs., at 6s. 8d. per bushel	3	12	6
Cost for twelve birds	£6	17	8
		s.	*d.*
Cost per bird		11	6

Pen 1 laid 1,257 eggs, and pen 2 laid 1,294, a total of 2,551 eggs for the twelve birds, the eggs averaging 2s. 1.86d. per dozen.

PENS 3 AND 4. MEAT FED.

	£	*s.*	*d.*
Ground wheat, 342 lbs., at 6s. 8d. per bushel	1	18	0
Cost of grinding		2	8
Pollard, 108 lbs., at £9 5s. per ton		10	0
Bran, 225 lbs., at £7 5s. per ton		16	4
Meat meal in mash, 45 lbs., at £1 per 100 lbs.		9	0
Meat meal in front of birds, 51½ lbs., at £1 per 100 lbs.		10	4
Whole wheat, 668 lbs., at 6s. 8d. per bushel	3	14	2
Cost for twelve birds	£8	0	6
		s.	*d.*
Cost per bird		13	4½

Pens 3 and 4 laid 1,482 and 1,605 eggs respectively, a total of 3,087 eggs for the twelve birds. Examining the results, it is worthy of note that whilst pens 3 and 4 laid the most eggs, they also cost the most to feed. It would appear that the inclusion of meat meal makes the mash more appetizing, and results in increased consumption. A total of 96½ lbs. of meat meal was consumed by the twelve birds, 45 lbs. of which was fed in the morning mash, and 51½ lbs. eaten from hoppers, where it was always available for the birds to pick at. The meat-fed birds cost 1s. 10d. a bird more to feed than the non-meat pens, but against this they produced an average of forty-five more eggs each. At the average market price available this showed an extra return for

the meat-fed birds of 8s. 1d., or an extra profit of 6s. 2d. each, which indicates that the increase of animal food to the ration not only increases the egg yield, but the net profit as well.

The cost of feed is based on the wholesale ruling rates at the time the food was bought. The test is being continued for another year, with the rations reversed, consequently pens 1 and 2 are now receiving meat meal, while pens 3 and 4 have none.

ERADICATION OF ST. JOHN'S WORT BY MEANS OF INTRODUCED INSECTS.

Some time since when the Bureau of Science and Industry had under consideration the question of the eradication of St. John's wort (*Hypericum perforatum*), it was suggested that a possible solution of the problem might be the introduction of some insect which would feed only on St. John's wort. As a first step the institute communicated with Professor E. B. Poulton, F.R.S., Oxford, and Mr. J. C. F. Fryer, Entomologist, Board of Agriculture, London, and as a result of the information thus obtained, it was arranged for the Imperial Bureau of Entomology to undertake an investigation into the insects attacking St. John's wort in England.

In a letter addressed on the 18th November last to the Commonwealth Institute of Science and Industry by the Director of the Imperial Bureau, it is stated that the researches undertaken have not revealed the existence of any insect likely to be of practical importance in the eradication of St. John's wort here.

The letter is as follows:—

"In reply to your letter of 13th September, I have to inform you that last year the managing committee of this bureau made arrangements with Mr. A. H. Hamm, of the Oxford University Museum, to undertake an investigation into the insects attacking *Hypericum perforatum* in that neighbourhood.

I regret to say that his researches have not revealed the existence of any insect that is likely to be of practical importance from your point of view.

Early this year he furnished us with a brief report on the insects he had found up to that date, a copy of which I enclose herewith.

He has recently written to say that, in spite of prolonged examination of the seeds of this plant during the past autumn, he has failed to find any insect whatever feeding upon them.

As you will see, the only species that appears to do any serious harm to the plant is the Phytophagous beetle (*Chrysomela varians*), but our sub-committee that was appointed to report on the matter decided that it would be a very dangerous experiment to introduce an insect of this kind into Australia.

In the circumstances, it appears to be hardly worth while to continue the investigation, but I will bring the subject forward at a general meeting of our committee which is to be held on the 25th inst.

Report on Hypericum perforatum, L.

By A. H. Hamm, F.E.S.

During the past year (1919) I undertook at the desire of Professor Poulton, F.R.S., and Dr. G. A. K. Marshall, D.Sc., to try and ascertain, if possible, whether there were any insects that destroyed the seed of *Hypericum perforatum.* Up to now my efforts have been negative. Close observation was kept during the season on the various stations where the plant grew more or less in profusion in order to note the permanent effect of the various insect larvæ feeding upon it. With this object in view periodical visits were made from May to the beginning of November.

Though the economic results were rather disappointing they were not devoid of interest, and may prove of some value for future investigation.

The following insect larvæ were found feeding upon *H. perforatum:*—

Lepidoptera.

Geometridæ.—The larvæ of several species were found, the most abundant being *Anaitis plagiata,* L., but the damage to the plant was insignificant.

Noctuidæ.—A few larvæ only.

Tineina.—The apical leaves and flower heads spun together by the larvæ of *Depressaria liturella,* Hb.=*hypericella,* Tr. were plentiful everywhere. Although effectually destroying the apical shoot the injury has the effect of stimulating the growth of the lateral stems, and consequently the ultimate flowering capacity of the plant is very little impaired.

The larva of the small Tineid *Gracilaria auroguttella,* St., was also fairly common, although the damage done was of no consequence.

The larvæ of the leaf-miner *Nepticula septembrella,* Sta., were also common, but do not damage the plant.

Coleoptera.

Phytophaga.—Chrysomela varians, Schal. This species is more or less local, but fairly abundant where it occurs. The larvæ are found more often on *H. hirsutum,* although I succeeded in finding them on *H perforatum,* in a locality near Aldermaston, Berks, where I knew it formerly existed in profusion. At this spot I used to get the beetle twenty-five years ago, and again during the past season found its larvæ in as great abundance as before. It was especially interesting to find that the beetle had existed undiminished over so long a period in that one locality; and the fact may be of some economic importance. The beetle larvæ were observed to feed very largely on the flowers, both expanded and unexpanded, by this means greatly diminishing the quantity of seed.

Diptera.

Cecidomyidæ.—The larvæ of *Perrisia hyperici,* Bremi, were found, but not in sufficient numbers to be of any economic value. The apical leaves are merely bunched together, so that the flower heads mostly escape.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Green Manures.

If a cover crop of leguminous plants is required for green manuring a start at planting may now be made. This can be done only when all the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before the winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will adequately cover the surface before winter.

Cultivation.

Should the weather remain hot and dry it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

Pests.

No codlin moth-affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

All rust-affected foliage and fruit of plum and peach trees, as well as all other stone fruits that have been attacked by this and other fungus diseases, such as shot-hole, &c., should be burned if possible. This will minimize the possibility of future attacks.

The Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through until the spring time.

The section should be well dug over for planting winter crops. Before digging a light sprinkling of bonedust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus for the soil. Large plots should be avoided in winter; where such occur a path should be run down the centre. This will provide more efficient drainage. The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrots, radish, cabbage, cauliflower, and swede turnip may be sown.

Asparagus beds should be cleaned up and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up: rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

The Flower Garden.

All classes of spring-flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The manure should, some time previously, have been dug well in, and mixed with the soil, and all heat should have disappeared. If manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

The increasing prevalence of both bulb mite and rhizoctinia fungus in attacking bulbs makes it a matter of urgency that all bulb gardens and plots should be well dressed with lime before the bulbs are planted. The lime should be dug into the soil; and after the bulbs have been planted, a top-dressing should also be given. Each dressing need not exceed 2 ozs. per square yard.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure. In any case the feeding should not be too strong nor too frequent, and it should always be withheld before the flowers come.

All hardy annual, biennial, and perennial seeds may now be planted. Among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove, phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur the plants should be sprayed with benzole emulsion, nicotine, pestend, or soaperine, or some other preventive in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow. They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

In preparing the soil for planting the trees care should be taken not to dig small holes. A small hole is simply a "pot hole," in which the winter water accumulates, and as a result the young tree roots are rotted.

A large hole should be dug; or better still, the whole planting area should be well cultivated all over, and the plants or trees then set out in this cultivated area.

REMINDERS FOR APRIL.

LIVE STOCK.

HORSES.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A. Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentiful. Take care that salt lick previously recommended is available. One or two pounds of linseed cake or meal given daily should be found beneficial. In addition to its feed value, the oil in the cake or meal will counteract the effect of dry feed, which is liable to cause impaction. Crushed oats is the cheapest feed on the market at present, and will well repay feeding to good cows.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape, barley (especially skinlesss), oats, &c., may be sown for grazing during winter. Crushed oats will be the most economical feed for pigs at present prices.

SHEEP.—Merino and fine cross ewes, if mated early, will lamb from now on. Those in lamb to the larger British breeds of rams can be expected to give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and pick up any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching, at the same time clear wool from around teats, and from the eyes. If the ewes are attentive mothers, any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

Poultry.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Add to drinking water one packet of Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit, shell, and charcoal should always be available.

CULTIVATION.

Farm.—Dig potatoes as they mature. Cart out and spread stable manure. Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—1½ bushels, Oats; ½ bushel, Cape Barley; ½ bushel, Tick Beans; ½ bushel, Pease. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

Orchard.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

Flower Garden.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs.

Vegetable Garden.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

Vineyard.—Examine "Yema" grafts to see if strings require cutting. Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of Vinegar Flies (*Drosophila funebris*). If present destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c.

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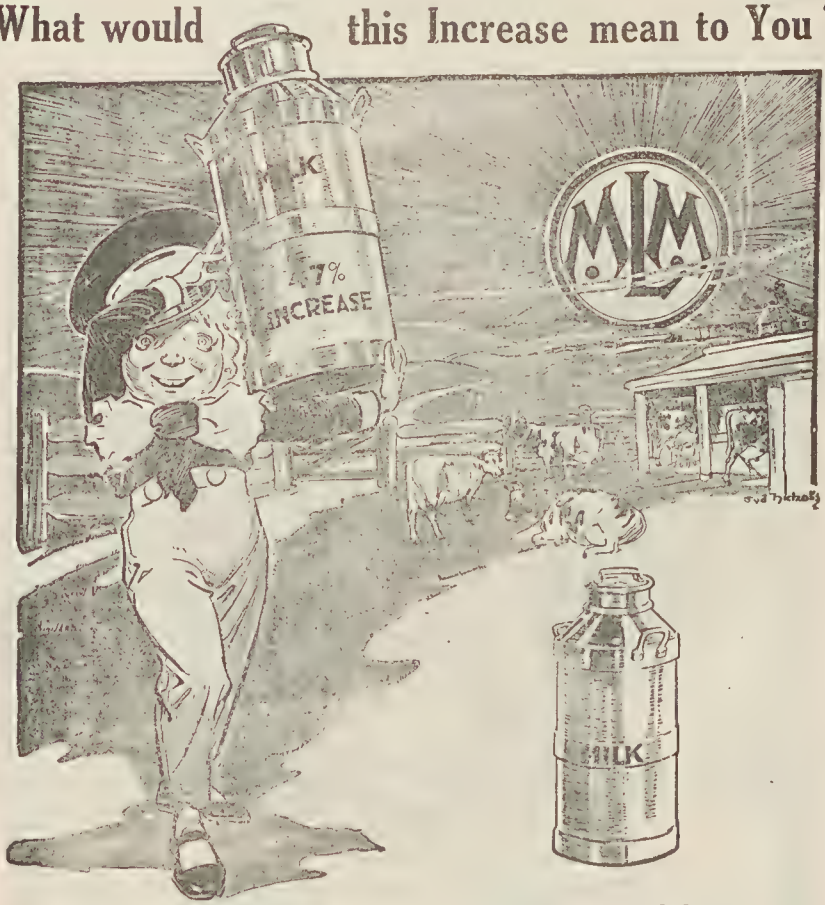

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To merely feed on stock grasses is not sufficient.

The Cow needs a milk-making ration high in protein, at the same time containing sufficient carbohydrates to provide body maintenance and energy.

Maximum production on pastures alone is impossible. Although they stimulate the milk flow, a concentrate rich in protein is necessary to balance the ration and increase both the weight and the productivity of the stock.

M|M Cattle Food, "The Ideal Concentrate," fed as directed, is unequalled as an economical food. It furnishes the Ideal ration because it contains the essential food elements, is easily digested, and supplies necessary energy to turn feed into milk.

We cater for each class of stock raised for profit.

Whether you be concerned with production of milk, beef, or eggs, the correct grade of M|M Specialized Stock Foods will help you. They are correctly balanced and scientifically formulated and must give greater results.

Write for Booklet on Scientific Feeding to M|M Stock Foods Department, D.H.

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Independent tests by the N.S.W. Department of Agriculture, as reported in their "Agricultural Gazette," March, 1920, shows that "Carlton" possesses, amongst others, the following points of superiority:—

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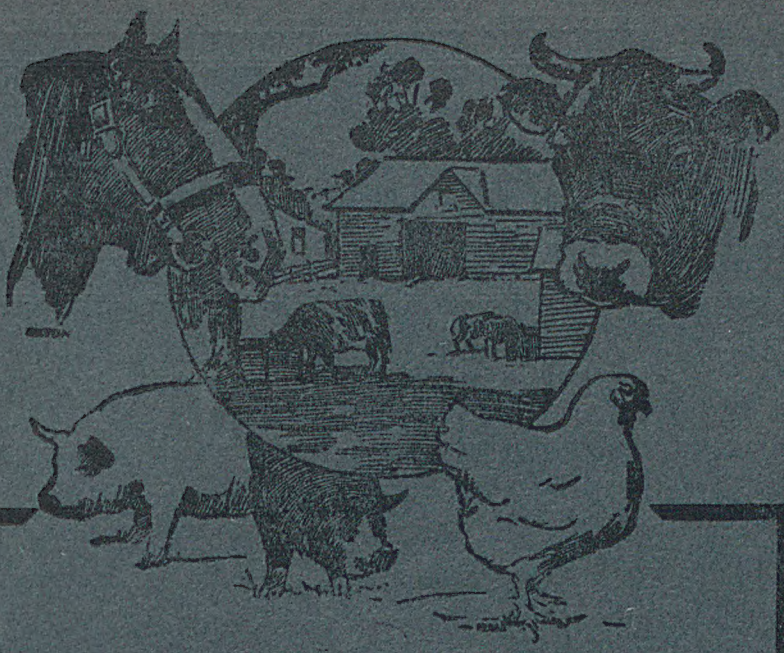

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MAIZE OIL MEAL differs from our "Polly" Brand Feed in that the latter is cheaper and produces bone and muscle, whereas Maize Oil Meal produces bone, muscle, fat, and a glossy and beautiful coat.

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